

UNITED STATES DEPARTMENT OF AGRICULTURE
OFFICE OF EXPERIMENT STATIONS

EXPERIMENT STATION RECORD

VOLUME 84

JANUARY-JUNE 1941



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1941

U. S. DEPARTMENT OF AGRICULTURE

SECRETARY—Claude R. Wickard

UNDER SECRETARY—Paul H. Appleby

ASSISTANT SECRETARY—Grover B. Hill

OFFICE OF EXPERIMENT STATIONS

CHIEF—James T. Jardine

ASSISTANT CHIEF—R. W. Trullinger

THE AGRICULTURAL EXPERIMENT STATIONS

ALABAMA—*Auburn*: M. J. Funchess.¹

ALASKA—*College*: L. T. Oldroyd.¹

ARIZONA—*Tucson*: P. S. Burgess.¹

ARKANSAS—*Fayetteville*: W. R. Horlacher.¹

CALIFORNIA—*Berkeley*: C. B. Hutchison.¹

COLORADO—*Fort Collins*: H. J. Henney.¹

CONNECTICUT—

[New Haven] Station: *New Haven*; W. L. Slate.¹

Storrs Station: *Storrs*; E. G. Woodward.¹

DELAWARE—*Newark*: G. L. Schuster.¹

FLORIDA—*Gainesville*: W. Newell.¹

GEORGIA—

Experiment: H. P. Stuckey.¹

Coastal Plain Station: *Tifton*; S. H. Starr.¹

HAWAII—*Honolulu*: J. H. Beaumont.¹

IDAHO—*Moscow*: E. J. Iddings.¹

ILLINOIS—*Urbana*: H. P. Rusk.¹

INDIANA—*La Fayette*: H. J. Reed.¹

IOWA—*Ames*: R. E. Buchanan.¹

KANSAS—*Manhattan*: L. E. Call.¹

KENTUCKY—*Lexington*: T. P. Cooper.¹

LOUISIANA—*University*: W. G. Taggart.¹

MAINE—*Orono*: F. Griffes.¹

MARYLAND—*College Park*: R. B. Corbett.¹

MASSACHUSETTS—*Amherst*: F. J. Sievers.¹

MICHIGAN—*East Lansing*: V. R. Gardner.¹

MINNESOTA—*University Farm, St. Paul*: C. H. Bailey.¹

MISSISSIPPI—*State College*: C. Dorman.¹

MISSOURI—

College Station: *Columbia*; M. F. Miller.¹

Fruit Station: *Mountain Grove*; P. H. Shepard.¹

Poultry Station: *Mountain Grove*; T. W. Noland.¹

MONTANA—*Bozeman*: C. McKee.¹

NEBRASKA—*Lincoln*: W. W. Burr.¹

NEVADA—*Reno*: S. B. Doten.¹

NEW HAMPSHIRE—*Durham*: M. G. Eastman.¹

NEW JERSEY—*New Brunswick*: W. H. Martin.¹

NEW MEXICO—*State College*: Fabian Garcia.¹

NEW YORK—

State Station: *Geneva*; P. J. Parrott.¹

Cornell Station: *Ithaca*; C. E. Ladd.¹

NORTH CAROLINA—*State College Station, Raleigh*:
L. D. Bayer.¹

NORTH DAKOTA—*State College Station, Fargo*: H. L.
Walster.¹

OHIO—*Wooster*: Edmund Seacrest.¹

OKLAHOMA—*Stillwater*: W. L. Blizzard.¹

OREGON—*Cornallis*: W. A. Schoenfeld.¹

PENNSYLVANIA—*State College*: S. W. Fletcher.¹

PUERTO RICO—

Federal Station: *Mayaguez*; Atherton Lee.¹

Insular Station: *Rio Piedras*; J. A. B. Nolla.¹

RHODE ISLAND—*Kingston*: B. E. Gilbert.¹

SOUTH CAROLINA—*Clemson*: H. P. Cooper.¹

SOUTH DAKOTA—*Brookings*: I. B. Johnson.¹

TENNESSEE—*Knoxville*: C. A. Mooers.¹

TEXAS—*College Station*: A. B. Conner.¹

UTAH—*Logan*: R. H. Walker.¹

VERMONT—*Burlington*: J. L. Hills.¹

VIRGINIA—

Blacksburg: A. W. Drinkard, Jr.¹

Truck Station: *Norfolk*; H. H. Zimmerley.¹

WASHINGTON—

College Station: *Pullman*; H. C. Johnson.¹

Western Station: *Puyallup*; J. W. Kalkus.¹

WEST VIRGINIA—*Morgantown*: C. R. Orton.¹

WISCONSIN—*Madison*: C. L. Christensen.¹

WYOMING—*Laramie*: J. A. Hill.¹

¹ Director.

² Acting director.

³ Superintendent.

EXPERIMENT STATION RECORD

EDITOR: HOWARD LAWTON KNIGHT

EDITORIAL DEPARTMENTS

Agricultural and Biological Chemistry—H. C. WATERMAN, GEORGIAN ADAMS.
 Agricultural Meteorology—F. V. RAND.
 Soils and Fertilizers—H. C. WATERMAN.
 Agricultural Botany, Diseases of Plants—H. P. BARSS, F. V. RAND.
 Genetics—G. HAINES, H. M. STEECE, J. W. WELLINGTON.
 Field Crops—H. M. STEECE.
 Horticulture and Forestry—J. W. WELLINGTON.
 Economic Zoology and Entomology—W. A. HOOKER, F. ANDRE.
 Animal Husbandry—G. HAINES, E. C. ELTING.
 Dairying and Dairy Farming—E. C. ELTING.
 Veterinary Medicine—W. A. HOOKER.
 Agricultural Engineering—H. C. WATERMAN.
 Agricultural Economics—F. G. HARDEN, B. YOUNGBLOOD.
 Rural Sociology—B. YOUNGBLOOD, F. G. HARDEN.
 Agricultural and Home Economics Education—F. G. HARDEN.
 Foods and Human Nutrition, Home Management and Equipment—STELL L. SMITH,
 GEORGIAN ADAMS.
 Textiles and Clothing—GEORGIAN ADAMS, H. M. STEECE.
 Indexes—MARTHA C. GUNDLACH.
 Bibliographies—CORA L. FELDKAMP.
 Cooperation with *Biological Abstracts*—F. V. RAND.

CONTENTS OF VOLUME 84

EDITORIALS

	Page
The fifty-fourth convention of the Association of Land-Grant Colleges and Universities	1
Research at the 1940 convention of the Association of Land-Grant Colleges and Universities	145
Agriculture at the Philadelphia meetings of the A. A. A. S.	289
The scope and use of <i>Experiment Station Record</i>	433
Experiment station research for 1941 conditions	577
Eugene Davenport, midwestern pioneer and prophet	721

STATION PUBLICATIONS ABSTRACTED

ALABAMA STATION:	Page	ARKANSAS STATION:	Page
Annual Report 1938	13,	Bulletin 394	121
33, 44, 56, 63, 73, 88, 109, 131, 141		Bulletin 395	118
		Bulletin 396	57
ARIZONA STATION:		Bulletin 397	113
Technical Bulletin 85	45	Bulletin 398	120
Technical Bulletin 86	72	Bulletin 399	111
Technical Bulletin 87	399	Bulletin 400	111
Annual Report 1939	11, 13, 17, 33,	Bulletin 401	34
44, 59, 73, 89, 101, 108, 121, 141			

ARKANSAS STATION—Continued.		Page	[CONNECTICUT] STORRS STATION:		Page
Bulletin 402	-----	38	Bulletin 234	-----	295
Bulletin 403	-----	40	DELAWARE STATION:		
Bulletin 404	-----	57	Bulletin 221	-----	359
Bulletin 405 (Annual Report			Bulletin 222	-----	191
1940)	612, 617, 630, 648,		Bulletin 223	-----	6
655, 677, 681, 688, 703, 718			Bulletin 224	-----	114
Bulletin 406	-----	746	Bulletin 225	-----	71
CALIFORNIA STATION:			Bulletin 226	-----	368
Bulletin 636	-----	440	FLORIDA STATION:		
Bulletin 637	-----	594	Bulletin 347	-----	624
Bulletin 638	-----	298	Bulletin 348	-----	485
Bulletin 639	-----	295	Bulletin 349	-----	486
Bulletin 641	-----	258	Bulletin 350	-----	624
Bulletin 643	-----	680	Bulletin 351	-----	613
Bulletin 644	-----	792	GEORGIA STATION:		
Hilgardia, vol. 13—			Bulletin 205	-----	6
No. 4, June 1940	-----	54	Bulletin 206	-----	187
No. 5, Aug. 1940	454, 455		Bulletin 207	-----	321
No. 6, Aug. 1940	-----	496	Circular 122	-----	474
No. 7, Nov. 1940	-----	791	Circular 123	-----	326
The Distribution of California Buckeye in the Sierra Nevada in Relation to Honey Production	-----	653	Circular 124	-----	614
COLORADO STATION:			Circular 125	-----	765
Bulletin 460	-----	237	Annual Report 1940	-----	33, 44,
Bulletin 461	-----	466	56, 59, 74, 89, 105, 110, 122, 141		
Bulletin 462	-----	690	GEORGIA COASTAL PLAIN STATION:		
Bulletin 463	-----	613	Circular 7	-----	659
Colorado Farm Bulletin—			IDAHO STATION:		
Vol. 2, No. 4, Oct.-Dec. 1940	-----	295	Bulletin 233	-----	825
300, 334, 364, 374, 405			Bulletin 236 (Annual Report 1939)	-----	293,
Vol. 3, No. 1, Jan.-Mar. 1941	764, 774, 824, 834		298, 316, 319, 320, 342, 357, 372, 383, 389, 399, 402, 412, 430.		
Annual Report 1940	-----	588,	Bulletin 237	-----	826
589, 612, 617, 630, 642, 655, 664, 677, 681, 692, 718.			ILLINOIS STATION:		
CONNECTICUT [NEW HAVEN] STATION:			Bulletin 466	-----	45
Bulletin 435	-----	47	Bulletin 467	-----	116
Bulletin 436	-----	228	Bulletin 468	-----	111
Bulletin 437	-----	271	Bulletin 469	-----	205
Bulletin 438 (Annual Report 1939)	-----	437, 442,	Bulletin 470	-----	534
463, 471, 478, 480, 494, 547, 575			Circular 508	-----	53
Bulletin 439	-----	443	Circular 509	-----	216
Bulletin 440	-----	646	Soil Report 67	-----	156
Bulletin 441	-----	592	Soil Reports 67-69	-----	442
			INDIANA STATION:		
			Bulletin 445	-----	265
			Bulletin 446	-----	263
			Bulletin 447	-----	255

INDIANA STATION—Continued.		Page	KENTUCKY STATION—Continued.		Page
Bulletin 448	-----	233	Bulletin 408	-----	376
Bulletin 449	-----	240	Bulletin 409	-----	408
Bulletin 450	-----	259	Regulatory Series Bulletin		
Bulletin 451	-----	361	22	-----	15
Bulletin 452	-----	404	Regulatory Series Bulletin		
Circular 234	-----	196	23	-----	332
Circular 255	-----	228	Regulatory Series Bulletin		
Circular 256	-----	304	24	-----	373
Circular 257	-----	350	Regulatory Series Bulletin		
Annual Report 1939	-----	150, 151,	25	-----	329
173, 178, 185, 196, 199, 212, 226,			Circular 51	-----	13
234, 243, 253, 256, 268, 286, 287					
IOWA STATION :			LOUISIANA STATION :		
Research Bulletin 273	-----	184	Bulletin 318	-----	320
Research Bulletin 274	-----	343	Bulletin 319	-----	266
Research Bulletin 275	-----	404	Bulletin 320	-----	119
Research Bulletin 276	-----	403	Bulletin 321	-----	116
Research Bulletin 277	-----	356	Bulletin 322	-----	405
Research Bulletin 278	-----	829	Bulletin 323	-----	357
Research Bulletin 279	-----	413	Bulletin 324	-----	409
Research Bulletin 280	-----	471	Bulletin 325	-----	403
Research Bulletin 281	-----	466	Bulletin 326	-----	830
Research Bulletin 282	-----	574	Circular 27	-----	804
Research Bulletin 283	-----	522	MAINE STATION :		
Research Bulletin 284	-----	810	Bulletin 399	-----	265
Bulletin P14, new series	-----	194	Bulletin 401	-----	696
Bulletin P15, new series	-----	331	Bulletin 402	-----	633
Bulletin P16, new series	-----	382	Official Inspections 175	-----	694
Bulletin P17, new series	-----	678	Official Inspections 176	-----	798
Bulletin P18, new series	-----	789	Official Inspections 177	-----	740
Contribution Iowa Corn Re-			MARYLAND STATION :		
search Institute, vol. 1, No.			Bulletin 432	-----	403
3, June 1940	-----	678	Bulletin 433	-----	348
Soil Survey Report 79	-----	298	Bulletin 434	-----	407
			Bulletin 435	-----	538
KANSAS STATION :			MASSACHUSETTS STATION :		
Bulletin 289	-----	184	Bulletin 370	-----	107
Bulletin 291	-----	465	Bulletin 371	-----	334
Technical Bulletin 49	-----	502	Bulletin 372	-----	51
Technical Bulletin 50	-----	674	Bulletin 373	-----	124
Circular 199	-----	333	Bulletin 374	-----	551
Circular 200	-----	382	Bulletin 375	-----	500
Circular 201	-----	341	Bulletin 376	-----	476
Circular 202	-----	430	Control Series Bulletin 103	-----	107
Circular 203	-----	763	Control Series Bulletin 104	-----	798
KENTUCKY STATION :			Control Series Bulletin 105	-----	740
Bulletin 403	-----	117	Control Series Bulletin 106	-----	740
Bulletin 404	-----	103	Meteorological Series Bul-		
Bulletin 405	-----	117	letins 613-624, Jan.-Dec.		
Bulletin 406	-----	117	1940	-----	586
Bulletin 407	-----	328			

MICHIGAN STATION :	Page	MISSOURI POULTRY STATION :	Page
Special Bulletin 303.....	92	Bulletin 41.....	97
Special Bulletin 304.....	616		
Special Bulletin 305.....	831	MONTANA STATION	
Technical Bulletin 173.....	87	Bulletin 380.....	254
Technical Bulletin 174.....	661	Bulletin 381.....	122
Circular 172.....	430	Bulletin 382.....	112
Circular 173.....	90	Bulletin 383.....	538
Circular 174.....	679	Bulletin 384.....	785
Circular 175.....	756	Circular 157.....	373
Circular 176.....	739	Circular 158.....	527
Quarterly Bulletin, vol. 23—		Circular 159.....	672
No. 1, Aug. 1940.....	183,	Circular 160.....	670
188, 192, 194, 196, 215, 216,		[Mimeographed Circular 21]—	262
230, 234, 239, 260.		Annual Reports 1939-40.....	587,
No 2, Nov. 1940.....	583,	605, 608, 612, 617, 630, 642, 655,	
584, 621, 626, 656, 659, 661,		662, 668, 678, 693, 717, 718	
665, 667, 674, 679, 682, 698			
MINNESOTA STATION :		NEBRASKA STATION :	
Bulletin 349.....	327	Research Bulletin 120.....	94
Bulletin 350.....	829	Circular 65.....	386
Technical Bulletin 143.....	437	Circular 66.....	575
Technical Bulletin 144.....	536		
MISSISSIPPI STATION :		NEVADA STATION :	
Bulletin 338.....	15	Bulletin 154.....	464
Bulletin 341.....	39		
Bulletin 342.....	325	NEW HAMPSHIRE STATION .	
Bulletin 343.....	408	Bulletin 321.....	263
Bulletin 344.....	545	Bulletin 321, Reference Sup ..	685
Bulletin 345.....	320	Bulletin 322.....	260
Bulletin 347.....	658	Bulletin 323.....	405
Bulletin 348.....	755	Bulletin 324.....	326
Bulletin 349.....	756	Bulletin 325.....	409
Bulletin 350.....	760	Bulletin 326.....	322
Technical Bulletin 25.....	98	Bulletin 327.....	656
Technical Bulletin 26.....	427	Bulletin 328.....	616
Mississippi Farm Research, vol. 3—		Technical Bulletin 74.....	300
No. 8, Aug. 1940.....	15,	Scientific Contribution 74.....	395
34, 46, 48, 52, 60, 89, 127, 141		Scientific Contribution 75.....	614
No. 9, Sept. 1940.....	300,	Scientific Contribution 76.....	474
302, 319, 330, 361, 372, 401,		Scientific Contribution 77.....	50
405, 429, 430.		Scientific Contribution 78.....	587
No. 10, Oct. 1940.....	330,		
331, 334, 350, 374, 381, 385		NEW JERSEY STATIONS :	
MISSOURI STATION :		Bulletin 680.....	656
Bulletin 420.....	410	Bulletin 681.....	157
Bulletin 421.....	828	Bulletin 682.....	661
Research Bulletin 319.....	240	Bulletin 683.....	807
Research Bulletin 320.....	387	Bulletin 684.....	831
Research Bulletin 321.....	376	Bulletin 685.....	805
Research Bulletin 322.....	812	Circular 401.....	659
Circular 210.....	754	Circular 402.....	621
		Circular 403.....	635
		Analyses of United States	
		Soils, I, North Atlantic	
		States.....	156

NEW JERSEY STATIONS—CON.		Page	NORTH DAKOTA STATION:		Page
Annual Report 1940.....	735,		Bulletin 294.....		118
751, 758, 760, 765, 766, 769, 783,			Bimonthly Bulletin, vol. 3—		
786, 794, 805, 813, 823, 859.			No. 1, Sept. 1940.....		161,
			180, 184, 204, 235, 267, 287		
NEW MEXICO STATION:			No. 2, Nov. 1940.....		440,
Bulletin 272.....	92		465, 469, 471, 477, 493, 499,		
Bulletin 273.....	266		508, 536.		
[NEW YORK] CORNELL STATION:			OHIO STATION:		
Bulletin 734.....	286		Bulletin 613.....		323
Bulletin 735.....	263		Bulletin 614.....		410
Bulletin 736.....	267		Bulletin 615.....		348
Bulletin 737.....	407		Bulletin 616.....		765
Bulletin 738.....	369		Bimonthly Bulletin 205.....		38,
Bulletin 739.....	99		51, 55, 68, 90, 91, 94, 110		
Bulletin 740.....	504		Bimonthly Bulletin 206.....		215,
Memoir 231.....	287		225, 263		
Annual Report 1940.....	735,		Bimonthly Bulletin 207.....		765,
747, 751, 759, 761, 765, 766, 769,			804, 827		
781, 786, 795, 802, 805, 813, 826,			Bimonthly Bulletin 208.....		736,
827, 834, 859.			754, 797		
NEW YORK STATE STATION:			OKLAHOMA STATION:		
Bulletin 602.....	86		Bulletin 241.....		406
Bulletin 603.....	152		Bulletin [244].....		382
Bulletin 604.....	206		Bulletin 245.....		365
Bulletin 605.....	365		Current Farm Economics, vol. 13—		
Bulletin 606.....	812		No. 4, Aug. 1940.....		256
Technical Bulletin 253.....	99		No. 5, Oct. 1940.....		402
Technical Bulletin 254.....	809		No. 6, Dec. 1940.....		681
Technical Bulletin 255.....	477		Biennial Report 1939-40.....		735,
Farm Research—			747, 752, 757, 770, 781, 786, 795,		
Vol. 6, No. 4, Oct. 1, 1940.....	150,		802, 806, 827, 834, 859.		
152, 185, 190, 202, 205, 215,			[OKLAHOMA] PANHANDLE STATION:		
235, 241.			Panhandle Bulletin 66.....		90
Vol. 7, No. 1, Jan. 1941.....	590,		OREGON STATION:		
616, 617, 618, 619, 622, 624,			Bulletin 368.....		337
630, 634, 647, 648, 663, 664,			Bulletin 369.....		139
---			Bulletin 370.....		91
Annual Report 1940.....	582,		Bulletin 371.....		113
589, 616, 618, 642, 693, 718			Bulletin 372.....		55
NORTH CAROLINA STATION:			Circular 134.....		140
Bulletin 327.....	622		Circular 135.....		109
Bulletin 328.....	616		Circular of Information 221.....		211
Technical Bulletin 63.....	659		PENNSYLVANIA STATION:		
Technical Bulletin 64.....	684		Bulletin 392.....		85
Technical Bulletin 65.....	621		Bulletin 399 (Annual Report		
AE-RS Information Ser. 6.....	544		1940).....		442,
AE-RS Information Ser. 7.....	682		463, 464, 471, 478, 480, 495, 506,		
Agronomy Information Cir.			517, 536, 537, 545, 547, 575.		
126.....	41		Bulletin 400.....		496
Agronomy Information Cir.					
127.....	328				

PENNSYLVANIA STATION—Con.		Page	TENNESSEE STATION :		Page
Bulletin 401.....		508	Bulletin 172.....		381
Journal Series Paper 930.....		472	Popular Bulletin 1.....		14
Journal Series Paper 932.....		472	Circular 68.....		54
Journal Series Paper 934.....		472	Circular 69.....		230
Journal Series Paper 940.....		472	Circular 70.....		193
Journal Series Paper 942.....		472	Circular 71.....		472
Journal Series Paper 952.....		475	Circular 72.....		792
Journal Series Paper 959.....		648	Agricultural Economics and		
Journal Series Paper 987.....		685	Rural Sociology Depart-		
Journal Series Paper 992.....		682	ment—		
Journal Series Paper 998.....		472	Monograph 102-A to I.....		261
Journal Series Paper 999.....		472	Monograph 111.....		38
Journal Series Paper 1002.....		472	Monograph 112.....		268
Journal Series Paper 1007.....		472	Monograph 113.....		264
Journal Series Paper 1008 ..		472	Monograph 114.....		261
			Monograph 115.....		264
			Monograph 116.....		261
			Monograph 117.....		406
			Monograph 118.....		408
PUERTO RICO STATION :			TEXAS STATION :		
Report 1937 (Spanish ed.)		575	Bulletin 586.....		89
Report 1939		582,	Bulletin 587.....		299
600, 613, 618, 630, 639, 718			Bulletin 588.....		232
			Bulletin 589.....		231
			Bulletin 590.....		355
			Bulletin 591.....		355
			Bulletin 592.....		355
			Bulletin 593.....		445
			Bulletin 594.....		656
			Bulletin 595.....		727
			Circular 90.....		196
			Annual Report 1939.....		725, 735,
			752, 757, 770, 781, 786, 795, 806,		
			813, 823, 828, 836, 855, 856, 859		
			UTAH STATION :		
			Bulletin 292.....		374
			Bulletin 293.....		466
			Bulletin 294 (Biennial Report		
			1939-40)		733,
			735, 753, 758, 771, 787, 796, 806,		
			814, 823, 828, 836, 859.		
			Circular 114.....		536
			Farm and Home Science,		
			vol. 1—		
			No. 3, Sept. 1940.....		43, 86, 91, 97,
			108, 115, 121, 122, 123, 141		
			No. 4, Dec. 1940.....		587, 613, 616,
			620, 635, 651, 657, 678, 711		
			VERMONT STATION :		
			Bulletin 463 (Annual Report		
			1940)		152,
			158, 185, 197, 200, 235, 286, 287		

VERMONT STATION—Continued.

	Page
Bulletin 464.....	158
Bulletin 465.....	616
Bulletin 466.....	429
Bulletin 467.....	777
Bulletin 468.....	768

VIRGINIA STATION:

Bulletin 325.....	286
Bulletin 326.....	235
Bulletin 327.....	683
Bulletin 328.....	754
Technical Bulletin 66.....	258
Technical Bulletin 67.....	258
Multigraphed Report 1.....	389
Analytical Index and List of Publications of the Vir- ginia . . . Station, 1888- 1938.....	141

VIRGINIA TRUCK STATION:

Bulletin 104.....	483
Bulletin 105.....	739

WASHINGTON STATION:

	Page
Bulletin 386.....	383
Bulletin 387.....	411
Bulletin 388.....	381
Bulletin 389.....	363
Bulletin 390.....	353
Popular Bulletin 159.....	341

WEST VIRGINIA STATION:

Bulletin 296.....	659
Bulletin 297.....	683
Bulletin 298 (Biennial Report 1939-40).....	735,
736, 748, 754, 758, 766, 771, 787, 796, 806, 827, 828, 841, 859.	

WISCONSIN STATION:

Bulletin 450 (Annual Re- port 1940, part 1).....	582, 660, 662, 663, 668, 678, 682, 693, 718
---	--

WYOMING STATION:

Bulletin 240.....	410
Bulletin 241.....	101
Bulletin 242.....	269

UNITED STATES DEPARTMENT OF AGRICULTURE
PUBLICATIONS ABSTRACTED

Technical Bulletin—

	Page
702.....	14
703.....	632
706.....	641
710.....	181
727.....	309
728.....	502
729.....	13
730.....	44
732.....	14
733.....	780
736.....	468
737.....	543
738.....	503
739.....	807
740.....	500
741.....	646

Farmers' Bulletin—

1026.....	763
1838.....	140
1839.....	35
1846.....	824
1848.....	300
1849.....	331
1850.....	366
1851.....	429

Farmers' Bulletin—Continued.

	Page
1852.....	754
1857.....	678
1858.....	826
1859.....	108

Statistical Bulletin—

70.....	480
71.....	341
72.....	408

Circular—

556.....	67
557.....	56
561.....	88
567.....	316
569.....	659
570.....	172
571.....	331
572.....	651
573.....	633
575.....	361
576.....	774
577.....	732
578.....	592

Leaflet—

199.....	476
200.....	641

Leaflet—Continued.	Page	BUREAU OF AGRICULTURAL ECO-	Page
201.....	762	NOMICS:	
202.....	758	Agricultural Economics Bibli-	
203.....	759	ography—	
Miscellaneous Publication—		No. 86.....	262
354.....	87	No. 87.....	257
364.....	196	No. 88.....	543
375.....	429	No. 89.....	544
381.....	478	No. 90.....	834
383.....	717	Economics Library List—	
384.....	104	No. 13.....	154
387.....	738	No. 14.....	119
388.....	197	No. 15.....	262
389.....	767	No. 16.....	411
391.....	374	No. 17.....	546
392.....	271	No. 18.....	542
393.....	97	No. 19.....	832
394.....	300	F. M. 8.....	406
396.....	856	Probable Effects of the Agri-	
397.....	108	cultural Conservation Pro-	
399.....	856	gram on Livestock Produc-	
404.....	825	tion in the Midwest Dairy	
407.....	736	Section, I-V.....	406
408.....	271	Standards of Value for Pro-	
Crops and Markets, vol. 17—		gram Planning and Build-	
No. 7, July 1940.....	118	ing.....	118
No. 8, Aug. 1940.....	266	Types of farming in Missis-	
No. 9, Sept. 1940.....	266	sippi.....	540
No. 10, Oct. 1940.....	544	AGRICULTURAL MARKETING SER-	
No. 11, Nov. 1940.....	686	VICE:	
Agricultural Statistics, 1940.....	686	Report of the Chief, 1940.....	685
Economic Analysis of the Food		BUREAU OF ANIMAL INDUSTRY:	
Stamp Plan, A Special Report.....	542	A Study of Some Problems	
Farm Tenure Improvement:		Involved in Measuring Per-	
Landlord-Tenant Cooperation		formance in the Horse.....	381
and Leasing Procedure.....	406	Report of the Chief, 1940.....	747,
Index-Catalogue of Medical and		794, 813, 837	
Veterinary Zoology.....	523	COMMODITY EXCHANGE ADMINIS-	
Technology on the Farm.....	402	TRATION:	
Yearbook 1940.....	686	Report of the Chief, 1940.....	686
Report of the Secretary of Agri-		BUREAU OF DAIRY INDUSTRY:	
culture, 1940..... 751, 756, 766, 769,		Report of the Chief, 1940.....	662
784, 794, 805, 813, 827, 856, 859		BUREAU OF ENTOMOLOGY AND	
BUREAU OF AGRICULTURAL CHEMIS-		PLANT QUARANTINE:	
TRY AND ENGINEERING:		E-496-514.....	493
ACE-55. Farm Products and		E-518.....	638
Byproducts for Industrial		Insect Pest Survey Bulletin—	
Use.....	584	Vol. 17, Nos. 1, 3, 6-9,	
Report of the Chief, 1940.....	725, 822	Sups.....	784
		Vol. 18, Nos. 1, 3, 4, 6, 7,	
		9, Sups.....	784

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE—Con.	Page	BUREAU OF PLANT INDUSTRY : [Soil Survey Report]—	Page
Insect Pest Survey Bul.—		Series 1932—	
Con.		No. 40-----	156
Vol. 19, Nos. 1, 3, 4, 7-10.		Series 1933—	
Sups.-----	784	No. 33-----	156
Vol. 20, Nos. 1, 4, 7-9,		No. 34-----	156
Sups.-----	785	No. 35-----	442
Report of the Chief, 1940___	768, 783	Series 1934—	
FARM CREDIT ADMINISTRATION :		No. 18-----	13
Bulletin 40-----	541	No. 21-----	156
Circular C-118-----	832	No. 22-----	156
Circular C-119-----	832	Series 1936—	
Circular C-120-----	833	No. 3-----	13
Circular C-121-----	832	Plant Disease Reporter—	
South Brazil: New Land of		Vol. 24—	
Cotton-----	685	No. 16, Sept. 1, 1940_	59
FARM SECURITY ADMINISTRATION :		No. 17, Sept. 15,	
Report of the Administrator,		1940_	
1940-----	659	No. 18, Oct. 1, 1940_	199
OFFICE OF FOREIGN AGRICULTURAL		No. 19, Oct. 15, 1940_	199
RELATIONS :		No. 20, Nov. 1, 1940_	342
F. S. 83-----	411	No. 21, Nov. 15, 1940_	342
F. S. 84-----	548	No. 22, Dec. 1, 1940_	629
Foreign Agriculture, vol. 4—		No. 23, Dec. 15, 1940_	629
No. 8, Aug. 1940-----	256	Vol. 25—	
No. 9, Sept. 1940-----	256	No. 1, Jan. 15, 1941_	768
No. 10, Oct. 1940-----	410	No. 2, Feb. 1, 1941_	768
No. 11, Nov. 1940-----	540	No. 3, Feb. 15, 1941_	768
No. 12, Dec. 1940-----	686	Sup. 119, Dec. 31, 1939_	12, 59
Report of the Director, 1940_	686	Sup. 123, Oct. 1, 1940_	60
FOREST SERVICE :		Sup. 124, Nov. 1, 1940_	489
Caribbean Forester—		Sup. 125, Nov. 15, 1940_	480
Vol. 1, No. 1, Oct. 1939_	638	Sup. 126, Dec. 1, 1940_	485
Fire Control Notes, vol. 4—		Alyceclover-----	324
No. 3, July 1940-----	197	Publications Containing	
No. 4, Oct. 1940-----	197	Information on Soil	
Cost of Producing Pulpwood		Moisture and Soil Ero-	
on Farm Woodlands of the		sion-----	588
Upper Connecticut River		Report of the Chief.	
Valley-----	199	1940_____ 734, 750, 756, 758	
Forest Land Taxation in		SOIL CONSERVATION SERVICE :	
Michigan-----	539	Bibliography 2-----	268
Forest Survey Release Nos.		Bibliography 3-----	824
1-5, [Forest Resources of		Erosion Survey—	
North and South Caro-		No. 12-----	736
lina]-----	196	No. 13-----	736
Rural Assessment, With Spe-		No. 14-----	736
cial Reference to Forests_	683	No. 16-----	736
Report of the Acting Chief,		SCS-EP-17-----	680
1940-----	766	SCS-TP-15-----	465
BUREAU OF HOME ECONOMICS :		SCS-TP-28-----	679
Report of the Chief, 1940_	836,	SCS-TP-30-----	442
855, 856, 857		[SCS-TP-31, Sup.]-----	442

SOIL CONSERVATION SERVICE—Con	Page	WEATHER BUREAU—Continued.	Page
SCS-TP-33 -----	824	Monthly Weather Rev.—Con.	
SCS-TP-35 -----	154	(Subsequent numbers issued by the Department of Commerce not listed here)	
SCS-TP-36 -----	442	Climatological Data—	
SCS-TP-37 -----	442	Vol. 26, No. 13, 1939-----	12
Report of the Chief, 1940--	736, 823	Vol. 27, Nos. 1-6, Jan.—	
WEATHER BUREAU:		June 1940-----	734
Monthly Weather Review,		Report of the Chief, 1940---	734
vol. 6S—			
No. 5, May 1940-----	153		
No. 6, June 1940-----	153		

JOURNAL OF AGRICULTURAL RESEARCH

Vol. 60—	Page	Vol. 61—Continued.	Page
No. 11, June 1, 1940--	7, 41, 60, 66, 93	No. 3, Aug. 1, 1940-----	726,
No. 12, June 15, 1940-----	81,	760, 766, 773, 802, 804, 837, 859	
	46, 56, 61, 77	No. 4, Aug. 15, 1940-----	726,
Vol. 61—		728, 748, 772, 797, 798, 819	
No. 1, July 1, 1940-----	437,	No. 5, Sept. 1, 1940-----	738,
	444, 449, 463, 503, 527	704, 775, 792, 803, 820, 852	
No. 2, July 15, 1940-----	467,	No. 6, Sept. 15, 1940-----	737,
	483, 484, 490, 501, 507	750, 760, 774, 797	

EXPERIMENT STATION RECORD

VOL. 84

JANUARY 1941

No. 1

THE FIFTY-FOURTH CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

Democracy and agriculture, participation in the national defense program, inter-American relations, problems of rural youth, the preservation of institutional integrity and responsibility, training for public service, and the need for further development of home economics were the dominant themes of the 1940 convention. In their selection the association again revealed itself as alert and responsive to the needs of the hour. The topics were considered sympathetically and constructively. The result was a convention which rose above routine proceedings to provide much information and inspiration to the representative gathering of several hundred delegates and visitors in attendance.

Traditionally, these annual conventions afford a unique opportunity to visualize the current trends and problems of American agricultural education and research. Primarily, of course, they are held for the transaction of the association's business, and since under the system in vogue preliminary consideration of many business matters by subordinate groups as well as their final disposition by the executive body has been taking place increasingly behind closed doors, much goes on as to which the general public may go away somewhat unevenly informed. Nevertheless there still remains available, if not the comparatively complete picture obtainable in the earlier days, an extensive program of addresses and discussions which includes most of the urgent problems with which the land-grant institutions are confronted.

The convention was held in Chicago from November 11 to 13, 1940. Following recent practice, it was preceded by 3 days of pre-convention sessions of subsections and committees. In these sessions much preparation and consideration of committee reports was accomplished, and among the results were a speeding up of convention business and an appreciable absence of congestion in both general and sectional sessions.

The opening address of the convention was that of its president, President F. D. Farrell of Kansas. Taking as his subject *Lest We Forget*, President Farrell briefly reviewed the accomplishments of the constituent land-grant institutions, which collectively now enroll over

250,000 students each year, carry on one of the world's largest research programs, and reach millions of farms and farm homes in extension work. He attributed their outstanding influence and popularity to their usefulness, and this in turn to their adherence to such fundamental principles as the judicious blending of practical and liberal elements in their curriculum and their demonstration in both peace and war of the feasibility of joint action of State and Federal agencies in research and education. The land-grant institutions, he maintained, are not and never should be "policemen, promoters, or propagandists," but should restrict their service to research and education.

The subject of the address of the Secretary of Agriculture, Hon. Claude R. Wickard, was Democracy: Think It, Strengthen It, Work at It. In this address, Secretary Wickard called attention to the work of the land-grant colleges in cooperation with the Department in helping farmers to set up discussion groups, and announced his plan to call a conference to develop ways and means for furthering the use by thousands of such groups and 4-H Clubs of educational materials on democracy which are expected to be available. He pointed out that "the weakest sectors of democracy on the agricultural front are in the low-income groups. . . . There must be productive work for these people to do, and they must be . . . rewarded fairly for doing it. Starting at rock bottom, one kind of work for them to do is obviously to produce a better supply of food for their own families and more of their own clothing and shelter and simple equipment with their own hands. Helping them to develop this sort of work is a job that our science and our education has shirked. We need research that will develop the types of vegetables and fruit and feed crops which will do best for the low-income farm family using part of its working hours in producing its own food. . . . A basic thing that could be done and isn't now being done is the revamping of our research and educational and action programs to give them guidance in good subsistence farming and good homemaking and good handicraft work."

The theme of national defense was developed by several speakers and from several angles. Thus, Mr. Emmett F. Connely, president of the Investment Bankers' Association of America, argued for the desirability of retaining as much as possible of the existing business structure and the preservation of private initiative even in a defense program, particularly as regards methods of financing. On the other hand, Mr. Chester C. Davis, Commissioner of Agriculture in the National Defense Advisory Commission, predicted that, regardless of the outcome of the struggle in the Eastern Hemisphere, the entire world of the future will be far different, and that in the inevitable readjustments capital, labor, and agriculture must make substantial

concessions and adopt a constructive attitude based on the general welfare of the Nation. He counseled a restudy of agricultural research and extension projects in the light of the new conditions.

Specific contributions to the defense programs were outlined for education by Dr. F. J. Kelly of the Office of Education, substituting for Commissioner J. W. Studebaker. Dr. Kelly described the Federal legislation of October 9, 1940, making available \$60,500,000 for defense vocational training. This legislation supplemented a grant of \$15,000,000 in June for vocational education of less than college grade, under which about 130,000 students were enrolled and 75,000 had already completed short training courses in mechanical trades, such as riveting. The new appropriation is partly in extension of this program, but also includes \$9,000,000 for short engineering courses of college grade, \$7,500,000 in connection with the work of the National Youth Administration, and \$10,000,000 for out-of-school rural youth and nonrural youth in agricultural high schools and related institutions in an attempt to equalize the opportunities for youth in rural areas to share in preparation for service in the national defense program. The training provided will be largely in mechanical occupations common to the farm but also basic to defense industry needs.

Still another defense phase to be considered was that of nutrition needs, to which the home economics section devoted a session with Director M. L. Wilson of the Department's Extension Service as the principal speaker. A discussion followed as to how various agencies may contribute to a nutrition program, led by Dr. Louise Stanley, Chief of the Bureau of Home Economics, and participated in for extension phases by Director J. W. Burch of Missouri, State nutrition councils by Miss Mildred F. Horton of Texas, land utilization by Director A. E. Bowman of Wyoming, farm security by Miss Leila Ogle of Indiana, and experiment stations by Miss Sybil L. Smith of the Office of Experiment Stations. Subsequently, in the experiment station subsection, the need was pointed out for nutritional family inventories and for study of food habits and causes of the decline in home production of foods.

Some idea of what is going on in agriculture was afforded by the address by Dr. T. W. Schultz of Iowa on the subject of The Outlook for American Agriculture. Because of the operation of world economic forces, Dr. Schulz pointed out that agriculture both in this country and abroad needs much more guidance and attention by governments than formerly. Disintegration of foreign trade in particular has created a situation where individualism is no longer adequate and control measures may be inevitable regardless of the outcome of the war. The problem, in his opinion, is the best combination of public and private management with a minimum of centralization in action programs pending research as to their permanent effectiveness.

The need of promoting hemisphere solidarity was brought before the convention as a whole by Mr. Charles A. Thomson, Chief of the Division of Cultural Relations of the U. S. Department of State, in a paper entitled *Toward Inter-American Cooperation*. Mr. Thomson referred especially to efforts under way to improve economic relations by the development in South and Central America of crops now imported by the United States from other sources and also the necessary step of deepening cultural contacts. In the latter direction he indicated that the land-grant institutions might be of special service through exchange relationships, development of courses, and the stimulation of interest. A report from the Committee on Inter-American Cooperation in Agricultural Education (E. S. R., 83, p. 289), which in cooperation with the State Department and the Office of Education is acting as a clearing house for information along these lines, was also presented by its chairman, Dean K. A. Ryerson of California and received consideration in a number of groups.

One of the most distinctive features of the convention was its interest in the problems of rural youth. An address by Dr. O. E. Baker of the U. S. D. A. Bureau of Agricultural Economics entitled *Rural Youth in the Farm Picture* was included in the program of the general sessions, and the joint session of the three subsections of agriculture was given almost entirely to a consideration of older youth and its interests and problems. At this session the topic *Situations and Problems of Older Rural Youth* was discussed by Dr. C. C. Taylor of the Bureau of Agricultural Economics, and there was also the innovation of a panel discussion in which eight representatives of older youth groups and workers with such groups participated. In these ways a considerable breadth of viewpoint was obtained. Apparently the diminished opportunity for employment in the cities has created more desire to remain on the farms, but such handicaps are encountered as shortage of desirable farms, lack of capital, inadequate social and recreational opportunities, and an imperfectly realized group solidarity. Additional assistance to prospective farmers was advocated, but also greater attention to the preparation of rural youths for other pursuits.

Problems of training naturally received much attention from the subsection of resident teaching. At a luncheon meeting held jointly with the section of graduate work, the general theme was discussed by Dean S. W. Fletcher of Pennsylvania under the title *Are Our Graduates Properly Trained?* Later, a panel discussion on *Training for Public Service in the Field of Agriculture* was led by Mr. R. W. Trullinger, Assistant Chief of the Office of Experiment Stations, and participated in by Dr. E. C. Auchter, Chief of the Bureau of Plant Industry; Dr. S. S. Board of the Office of Personnel; Extension Direc-

tor H. C. Ramsower of Ohio; and Deans W. C. Coffey of Minnesota, C. B. Hutchison of California, H. H. Kildee of Iowa, I. O. Schaub of North Carolina, and S. W. Fletcher of Pennsylvania. At the joint session of the three subsections of agriculture, Dean C. L. Christensen presented a paper on Pre-theological Training in Colleges of Agriculture, in which he indicated the appropriateness of certain courses in these colleges for pre-theological students. Still another paper, by Associate Extension Director W. W. Clark of Wisconsin, took up Undergraduate Training for Extension.

Home economics has become increasingly important in the Nation's welfare. Under the title of Milestones and Guideposts in Agriculture and Home Economics, Dr. Lita Bane, head of the home economics department of the University of Illinois, gave data which showed an estimated enrollment in 1938-39 of 1,500,000 girls and 41,300 boys in home economics courses in junior and senior high schools, a total of 1,118,519 women in home economics extension courses, and approximately 580,000 girls who completed homemaking projects in 4-H Clubs. Less encouraging, however, was her feeling that "home economics teaching has outdistanced research to the point where we are in grave danger of crippling our teaching program unless some means can be found to further our research. . . . Specifically, we need more research in the fields of human feeding, housing, clothing, and relationships, using the tools of chemistry, bacteriology, physiology, psychology, economics, sociology, and such other fields as will help in discovering important facts that will promote human welfare."

Aside from those noted, the programs of the sections and their subdivisions followed for the most part along accustomed lines. Extensive consideration was given to research, but following the usual custom, discussion of this topic is reserved for the February issue of the *Record*.

The presidency of the association was bestowed upon Dean Emeritus F. B. Mumford of Missouri, with President A. G. Crane of Wyoming becoming vice president and Dean T. P. Cooper of Kentucky continuing as secretary-treasurer. On the executive committee, Dean Mumford was succeeded by Dean W. C. Coffey of Minnesota, and President C. A. Lory of Colorado by President E. G. Peterson of Utah. A list of section officers, committee changes, and related information may be found on page 144 of this issue.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

The effect of clipping and drying immature grasses on their yield and chemical composition, M. W. GOODWIN (*Delaware Sta. Bul.* 223 (1940), pp. 21, figs. 8).—The experiments reported in this bulletin were carried out by means of a two-tray, batch drier, heated by an oil burner and provided with a fan driven by a 15-hp. motor to draw the hot gases first through a tray of partly dried grass and then through another layer of fresh grass. The inlet temperature is thermostatically controlled at 250°–300° F., and practically all the heat is utilized in evaporating moisture by the time the gases are exhausted into the air. The grass brought in from the field is forked into one tray, which is conveyed upon rollers into the oven. When the grass is half dried the tray is withdrawn, its contents are forked into the second tray, the first is refilled with wet grass, and the two are then drawn back into the oven. As soon as the moisture content of the herbage in the partly dried tray has been brought below 10 percent, the drying is considered sufficient. A duplicate set of trays is provided on the opposite side of the drier, one set being always in the oven while the grass is being transferred from the other. From 15 to 30 min. are usually required for each stage of drying, depending upon the quantity of water to be evaporated. The baling, done immediately after cooling, was performed in a power baler capable of forming compact bales of about 125 lb. each without pulverizing the dried grass.

The total cost of production was about \$28 per ton under the experimental conditions obtaining.

The product retained its original green color. Comparative annual acreage yields of dry matter from frequently clipped artificially dried grass were greater than those of sun-cured hay. Frequent clipping of the immature grasses increased the acreage yields of protein from 40 to 60 percent over that recovered by the usual haymaking procedure. Artificial dehydration preserved more than five times as much carotene as did field curing. Only insignificant losses of carotene occurred during the artificial drying and baling of immature grasses. Loss of carotene during storage in bales was found most rapid during the first few months, particularly in hot weather. While the loss averaged 50 percent during the 10-mo. experimental period, the final product still contained from two to five times as much carotene as was found in the hay at time of storage. Reduction of moisture of herbage below 10 percent by artificial drying was valueless.

"The study indicates that it is possible to produce in Delaware a high yield of a high-protein, low-fiber, and high-carotene feed from a grass and clover mixture, and that it can be well preserved by artificial drying followed by storage in bales."

Microscopical studies of peanuts with reference to processing, J. G. WOODROOF and J. F. LEAHY. (Coop. Univ. Tenn.). (*Georgia Sta. Bul.* 205 (1940), pp. 39, figs. 17).—Starch grains were stained with iodine solution, cellulose cell walls being counterstained with fast green in clove oil and alcohol.

Aleurone grains were stained with eosin. Oil distribution was found to be best indicated by Sudan Black B or by Oil Red O. These fat stains penetrated tissue only slowly, but saturated solutions of the stains in 70 percent alcohol stained untreated sections of peanuts sufficiently in 1 min. Free oil on the surfaces of sections was avoided by chilling before cutting to 35° F. and examining the sections at this temperature.

The microscopic appearances of the epidermis, spongy parenchyma, vascular bundles, inner epidermis, and perisperm of the seed coat and of the epidermis, bunches, and parenchyma cells and cell contents of the embryo are described and illustrated, together with some changes in the microscopic structure of the embryo cells and their contents occurring during processing. Indications as to desirable and undesirable processing treatments obtained from the microscopic study are reported upon.

The Sudan Black B stain, applied and studied at 35°, indicated that the oil is distributed through the cells in the form of an extremely fine emulsion. Treatment of ground peanut meals for 12 hr. with vapors of ether, chloroform, or gasoline was found to break up this emulsion so effectively as to result in a 33 percent increase in the oil yield obtainable by cold-pressing. The hot-pressing yield was about the same as that from untreated material. Hot-pressed, vapor-treated nuts, however, yielded from 15 to 25 percent more oil than did hot-pressed, previously cooked nuts. Dry roasting had the effect that the aleurone grains, starch grains, and nucleus are drawn away from the cell walls into a hard mass near the center of the cell. "While heating lowers the viscosity of the oil and causes larger droplets to form, the hard mass in each cell renders pressing relatively ineffective in removing oil from the center of the mass." The microscopic indication was again confirmed in pressing practice, in which it was found that the yield of oil from grinding and pressing dry roasted peanuts was 35 percent less with cold-press, and 21 percent less with hot-press, than was the yield from raw nuts. Other relations between microscopic appearances and processing practice are brought out.

Hemicelluloses of alfalfa hay, M. PHILLIPS and B. L. DAVIS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 60 (1940), No. 11, pp. 775-780).—The authors isolated and fractionated the hemicelluloses of alfalfa hay, finding them to consist almost entirely of a fraction which, on hydrolysis, yielded *d*-xylose, together with a small amount (0.8 percent) of *l*-arabinose. This fraction contained also a uronic acid that was probably glucuronic acid or one of its methyl derivatives.

Hemicelluloses of wheat straw, H. D. WEIHE and M. PHILLIPS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 60 (1940), No. 11, pp. 781-786).—The hemicelluloses of wheat straw were isolated and freed of nitrogen and lignin. On fractionation, 100 gm. of the lignin- and nitrogen-free material, dissolved in aqueous sodium hydroxide, made slightly acid with acetic acid and precipitated with acetone yielded 79.2 gm. of a fraction which, on hydrolysis, yielded *d*-xylose, *l*-arabinose, and a uronic acid that was probably glucuronic acid or a methyl derivative of it. The molar ratio of uronic acid to *l*-arabinose and *d*-xylose in this fraction was found to be 1 : 0.9 : 23, respectively. On adding 95 percent alcohol to the filtrate from the major fraction until no more precipitate was formed, there was obtained 9 gm. of a further fraction which contained 3.66 percent ash and yielded uronic acid, as the anhydride, 9.64 percent, and pentosans 70.58 percent. This fraction was found to contain 3.74 percent methoxyl.

Improved rasp for securing pulp from sugar beets for analysis, J. G. LILL. (U. S. D. A. and Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 6, pp. 474, 475, fig. 1).—The beet rasping machine is described and illustrated.

"The basic idea embodied in the machine which has been devised is that the whole sugar beet roots comprising the sample, after being washed or cleaned, are individually placed in carrier boxes which move over the disk rasp in such a manner that a radial sector is removed from each root. The machine has the advantage of making unnecessary the splitting of the roots of the sample, an operation which in sugar analysis procedure usually requires the time of one man. The whole roots after sampling commonly are accepted by the sugar factory, whereas half or quarter beets may be refused as not usable."

The determination of lead in biological materials, S. L. TOMPSETT (*Biochem. Jour.*, 33 (1939), No. 8, pp. 1231-1236).—The method, consisting of destruction of organic material by ashing, extraction of the lead with ether as a complex with sodium diethyldithiocarbamate, and colorimetric estimation of lead with dithizone, is given in detail with regard to apparatus and reagents, and procedures as applied to urine, soft tissues, blood, feces, bone, and milk. Substances of high mineral content, chiefly phosphates, are ignited directly, but those of low mineral content (blood and soft tissues) are ignited with the addition of sodium phosphate to prevent volatilization of the lead. The reaction with diethyldithiocarbamate is carried out in an alkaline solution in the presence of cyanide and citrate which inhibit interfering reactions. The cyanide in alkaline medium inhibits the formation of copper or iron complexes, while the citrate, which also inhibits the formation of the iron complex, prevents the precipitation of phosphates from the alkaline medium. The lead complex is extracted with ether, the extracted lead being converted to the sulfate by digestion with sulfuric acid. After digestion and dilution, and addition of acetic acid and excess ammonia, the alkaline acetate solution of lead is treated with potassium cyanide and carbon tetrachloride and the reagent is added. The lead complex dissolves in the carbon tetrachloride to give a red solution from which any unchanged dithizone is extracted by shaking with potassium cyanide solution. The lead is estimated colorimetrically against a standard of comparable concentration similarly treated. Data reported in a series of recovery experiments indicate satisfactory recovery of added lead and satisfactory determinations over a range of 22 μ g. to 1.03 mg.

The determination of sulphur in biological material, M. MASTERS (*Biochem. Jour.*, 33 (1939), No. 8, pp. 1313-1324, fig. 1).—Four methods, three of them oxidation processes and the fourth involving hydrogenation, were studied. The sodium peroxide fusion method, adopted as Official by the A. O. A. C. (1935), was found to give accurate results but is considered unsuitable for routine sulfur determinations because of the constant care and attention (to prevent explosions) and the time involved. Of the wet ash procedures, the Benedict-Denis method was found unreliable, probably because of its failure to determine methionine sulfur accurately. The nitric-perchloric acid method, in which destruction of the organic material by a mixture of nitric and perchloric acids is followed by gravimetric estimation of the sulfate, gave reliable results, however, and was found adaptable to routine analyses. Large amounts of material could be taken if necessary and many determinations could conveniently be run simultaneously. This method is considered with regard to the digestion procedure adopted, the experience with explosions, the negligible effect of iron on the precipitation of barium sulfate, the loss of sulfur during oxidation, analyses of casein and compounds containing known amounts of sulfur, and recovery of added sulfur. Data on the latter point indicated very satisfactory recoveries.

The hydrogenation method, depending upon the reduction of S to H_2S which is estimated iodimetrically, was found satisfactory with the modifications

adopted. The reduction, catalyzed by platinized asbestos and effected by hydrogenation, was carried out in a quartz combustion tube under careful application of heat. The reagents, the apparatus, the hydrogenation procedure, the subsequent estimation of H_2S , the interference of metals, and the advantages and disadvantages of the method are considered in detail. Data presented show that the results compare favorably with those obtained by the fusion and the nitric-perchloric methods. The hydrogenation method was found quicker and more sensitive than the oxidation procedures studied and is considered the best available for the routine determination of sulfur.

The estimation of vitamin B_1 in blood.—II, A further modification of Meiklejohn's method, H. M. SINCLAIR (*Biochem. Jour.*, 33 (1939), fig. 12, pp. 2027-2036, fig. 1).—In this continuation of the series noted previously (E. S. R., 82, p. 298), a further modification of the Meiklejohn method is described in which the adjuvant action of blood upon the growth of the fungus is corrected by multiplying the weight of the fungus obtained in the presence of blood by the factor

$$\frac{\text{weight of fungus obtained with excess vitamin } B_1}{\text{weight of fungus obtained with excess vitamin } B_1 + \text{blood.}}$$

By this means the apparent values obtained by the original method can be translated into true values. In proof of the validity of this correction, data are presented showing that the unlike values obtained by the original method with the use of different volumes, 1, 2, and 3 cc., of blood became approximately the same when corrected by the method proposed, that high apparent values for recovery of added vitamin B_1 are reduced to within the limits of experimental error upon correction, and that the higher values previously obtained for large (more than 3 cc.) samples of blood without, rather than with, added vitamin B_1 are reversed when correction is applied. The question of proper size of blood samples to use for the test is discussed with evidence leading to the conclusion that the apparent values for normal blood can be estimated with greatest accuracy in a 1-cc. sample of blood but that in samples with an abnormally low content of vitamin B_1 , 2 cc. may be preferable. Inasmuch as the true or corrected values are approximately the same with 1-, 2-, and 3-cc. samples, it is considered legitimate to compare values obtained on samples of these three different sizes. In the present paper data on normal human blood were obtained on 1-cc. samples.

From the values obtained in 44 observations on different samples of his own blood over a period of 3 yr. and observations on 47 male and 26 female normal adults, the author considers the range of true or corrected values for vitamin B_1 in normal adults to be from 4.6 to 10.2 $\mu g.$ per 100 cc., with a value of 4.5 $\mu g.$ or less to be abnormally low. Differences between males and females were statistically insignificant.

Previous work by others on the vitamin B_1 content of the blood is discussed, with the comment that "the uselessness of most of the work done so far upon the amount of vitamin B_1 in blood or serum is distressing." In the author's opinion the thiochrome method "promises to be useful for whole blood, and even for serum or plasma if great care is taken to avoid hemolysis or contamination with blood cells and if the vitamin is freed from protein by warming or digestion with pepsin."

Quantitative estimation of nicotinic acid in urine, E. BANDIER (*Biochem. Jour.*, 33 (1939), No. 11, pp. 1787-1793, fig. 1).—The method outlined is based on the colorimetric method, involving the use of CNBr and metol, previously reported by Bandier and Hald (E. S. R., 82, p. 586). Since urine contains substances that mask the color reaction, the nicotinic acid is first extracted with a large excess of acetone from urine saturated with NaCl, the salt serving to flocculate the

precipitate that forms on adding the acetone. After the addition of water and evaporation of the acetone in vacuo, the reaction with CNBr and metol in the presence of KH_2PO_4 is permitted to take place, the mixture being left at room temperature protected from light for 1 hr. for color development. The color is read off in a Pulfrich photometer (filter S 43) against a solution containing the same amounts of the reagents and made up to volume with distilled water. The color of a blank, represented by the acetone extract similarly treated except that no metol is added, is measured and subtracted. From this result and the coefficient of extinction on a standard solution (0.1 mg. of nicotinic acid), the amount of nicotinic acid corresponding to the color developed can be calculated. The intensity of color, however, does not give a quantitative measure of nicotinic acid, since nicotinamide, nicotine (in the urine of smokers), and nicotinuric acid give the same yellow as nicotinic acid.

Coenzyme and cozymase, which contain nicotinamide in combination, do not respond to the color test. Preliminary hydrolysis of the urine with strong NaOH serves to hydrolyze these complexes, as well as nicotinamide and nicotinuric acid to give free nicotinic acid. Combining preliminary hydrolysis with the procedure outlined determines, therefore, the total amount of free and conjugated nicotinic acid.

Analyses by alkaline hydrolysis of the urines of 10 normal persons gave color-producing substances equivalent to 1.5–5 mg. of nicotinic acid. Ninety mg. of orally ingested nicotinic acid was almost quantitatively recovered in the urine within 6 hr., 14 percent being excreted in the first hour. After oral ingestion of nicotinic acid, part of it was excreted in a combined form, which was hydrolyzed under the same conditions as synthetic nicotinuric acid.

Preliminary study on the use of coconut oil for the determination of the moisture content of native style cheese, F. A. SOLIVEN (*Philippine Jour. Anim. Indus.*, 6 (1939), No. 6, pp. 449–457).—A simple method patterned after that described by Gould (E. S. R., 73, p. 588), but using coconut oil instead of olive oil, is described. Slightly, although not significantly, higher moisture readings were obtained by the coconut oil-salt method than by the oven-drying method.

A wet-crushing mill for micro-organisms, V. H. BOOTH and D. E. GREEN (*Biochem. Jour.*, 32 (1938), No. 5, pp. 855–861, pl. 1, figs. 3).—The essential feature of the mill described is a roller bearing so modified, by forcing a specially made inner race onto a tapered shaft, as to have no clearance between rollers and races, whereas the clearance of the usual type of precision roller bearing is never less than about 2.5μ , which would permit micro-organisms of average size to pass through intact. A diagrammatic drawing shows the main working parts of the mill. Some mechanical difficulties encountered are noted, and means by which they were overcome are described. With water cooling of the working parts and continuous passing of the suspension through a vaned cooling unit immersed in ice water, the bulk temperature of a yeast suspension rose only 2° [C.] in 60 min. of operation. The cell count of the yeast suspension was halved in 5 min. and was reduced below 10 percent of the original number in 30 min. Photomicrographs show the crushing effect on yeast cells and on *Bact[erium] coli*.

AGRICULTURAL METEOROLOGY

Milestones in meteorology, W. H. WENSTROM (*Sci. Mo.*, 51 (1940), No. 3, pp. 226–232).—A review setting forth the high lights of meteorological progress from earliest historical times to the present.

Agricultural meteorology (*Indian Sci. Cong. Proc. [Lahore]*, 26 (1939), pp. 200–202).—Abstracts of the following papers are included: On Radiation Mini-

imum Temperatures, by L. A. Ramdas and K. M. Gadre; Dates of Onset of the South-West Monsoon on the West Coast of India, by L. A. Ramdas, V. Satakopan, and S. Gopal Rao; Studies on Evaporation From the Surfaces of Soil Layers Resting on a Water Table, by L. A. Ramdas and A. K. Mallik; A Study of Transpiration in Relation to Meteorological Factors, and The Invisible Condensation of Water Vapour on the Soil and on Plant Materials Like Stalk, Leaves, and Grain, both by A. K. Mallik; and The Use of the Hot-Wire Anemometer in Studies of Micro-climates, by P. K. Raman.

[**Agricultural meteorology in the Philippines**] (*Natl. Res. Council Philippines Bul. 23* (1939), pp. 93, 94, 100, 107-109, 124, 125).—Abstracts are given of the following papers: The New Pluviometric System of the Philippines, The Drought of 1938 in the Philippines, and A Bibliography of Typhoons, all by M. Selga; and Some Characteristics of Philippine Typhoons, by C. El. Deppermann.

Hydrology of Virginia.—II, Flood studies; storms that have caused great floods; great rainfalls, P. H. MCGAUGHEY and H. B. SNYDER, JR. (*Engr. Expt. Sta. Bul. 44* (1940), pp. 94, pls. 8).—This study, supplementing part 1 of the series (*Engr. Expt. Sta. Bul. 79*, p. 157), concerns the maximum recorded flows of Virginia streams, the 1-, 2-, 3-, and 5-day rainfalls producing such floods, and the relationship between these rainfalls and the maximum recorded rainfalls. It is believed that existing data thus classified will be more readily available and useful.

Agricultural meteorology: A statistical study of conservation of precipitation by summer fallowed soil tanks at Swift Current, Saskatchewan, J. W. HOPKINS (*Canad. Jour. Res.*, 18 (1940), No. 8, Sect. C, pp. 388-400, figs. 4).—"Changes in the moisture content of summer fallowed soil in tanks 15 in. in diameter and 5 ft. deep set in pits in the center of field plots at the Dominion Experimental Station, Swift Current, Sask., which have been recorded at fairly frequent intervals during the summer months since 1922, provided two series of data, comprising observations in May and June and those in July and August. These have been analyzed statistically in order to relate conservation to precipitation after making allowance for other variable factors. Five-factor regression equations, fitted by the method of Least Squares, gave multiple correlation coefficients of 0.95 and 0.96 between the computed and observed conservation in the two series. It is inferred from these equations that under average conditions a 1-day rain to the amount of 0.36 in. in May-June and 0.46 in. in July-August would be required just to offset the subsequent evaporation during a 10-day period. Increased penetration and retention of the heavier rainfalls is very definitely indicated, and it is calculated that whereas on the average 66 percent of a 1-day rain of 1 in. in May-June would still be conserved at the end of 10 days, only 30 percent would be retained if the same amount was received in 5 daily showers each of 0.2 in. The intensity as well as the total amount of precipitation is thus emphasized as a factor of prime importance in its relation to soil moisture under semiarid conditions."

The drought of 1939 (*Arizona Sta. Rpt. 1939*, pp. 44, 45).—A brief note on the drought and the consequent shortage of water in the Gila River projects, and a progress report on the snow courses and snow surveys on the headwaters of the Gila River and Salt River (coop. U. S. D. A.).

What the summer has taught us about hurricane damage, P. E. ALDEN (*Natl. Shade Tree Conf. Proc.*, 15 (1939), pp. 100-109, figs. 5).—A summary of the damage to trees by the hurricane of September 21, 1938, and of the results of efforts toward reclaiming individual trees, and comparisons of the wind resistance of various species.

Salt spray damage from recent New England hurricane, R. H. WALLACE and A. E. MOSS. (Univ. Conn.). (*Natl. Shade Tree Conf. Proc.*, 15 (1939),

pp. 112-119).—A general discussion from observations of the damage undergone by conifers and broadleaf trees, with more detailed descriptions of the injuries to individual tree species. Broadleaf plants are said to present some hopes for recovery, but badly damaged conifers are probably not worth saving.

Influence of forest cover on wind velocity, W. L. FONS. (U. S. D. A. and Univ. Calif.). (*Jour. Forestry*, 38 (1940), No. 6, pp. 481-486, figs. 5).—In studying wind velocity as influenced by height above ground and by vegetation in grassland, brush, and even-aged ponderosa pine, the shapes of wind-velocity distribution curves proved distinctly different for each cover type. The results indicated that wind velocities at any two heights bear a linear relation to each other. The linear slope and intercept depended on the temperature difference between the two levels and on the height of the lower level above the ground. Wind velocity was greatly decreased at the top of the crowns and remained nearly constant in the canopy zone. In general, the velocity in the forest was not a constant percentage of the velocity above the tree crowns. For midday conditions, when the air temperature decreased with height, this percentage decreased as the wind velocity above the crown increased.

Note on the freezing of soil, R. K. SCHOFIELD (*Quart. Jour. Roy. Met. Soc. [London]*, 66 (1940), No. 285, pp. 167-170, figs. 4).

Weather and crops, B. A. KEEN (*Quart. Jour. Roy. Met. Soc. [London]*, 66 (1940), No. 285, pp. 155-166, figs. 5).—This is the Presidential address before the Royal Meteorological Society on January 24, 1940.

Climate and acclimatization: Some notes and observations, A. CASTELLANI (*London: John Bale, Sons & Curnock*, 1938, 2. ed., pp. X+198, [pls. 4], figs. [13]).—This book is "a collection of notes based chiefly on personal experience gathered in long sojourns in many different tropical countries" regarding the effects of climate on the health and well-being of man, and on acclimatization.

Climatological data for the United States by sections, [1939] (U. S. Dept. Agr., *Weather Bur. Climat. Data*, 26 (1939), No. 13, pp. [278], pls. 2, figs. 33).—Summaries are given of climatological data for each month of 1939 and for the year as a whole for each State.

[Weather data], N. W. NANCE (U. S. Dept. Agr., *Bur. Plant Indus., Plant Disease Rptr.*, 1939, Sup. 119, pp. 124, 125-134, figs. 20).—A summary of climatic data for the United States following the general plan of the previous report (E. S. R., 82, p. 17).

The weather and climate of Connecticut, J. M. KIRK (*Conn. State Geol. and Nat. Hist. Survey Bul.* 61 (1939), pp. 242+XI, figs. 12).—Much of the material used in this report was compiled from the files of the Boston, Hartford, and New Haven offices of the U. S. D. A. Weather Bureau, but many of the precipitation records were furnished by public and private water-supply organizations. Records from ± 75 stations are included, and for 12 of them 50 yr. or more are covered. At New Haven there is one of the longest records in the United States, viz, with few interruptions, from June 1778 to the present time. Brief discussions of the atmosphere and some atmospheric phenomena, the measurement of meteorological elements, weather forecasting, and climate are included. The main body of the report is taken up with the general conditions in the State, climatic characteristics, temperature, frost, precipitation, snowfall, humidity, sunshine, wind, great rainstorms, heavy snowstorms, destructive hailstorms, severe windstorms, abnormal seasons, droughts, temperature trends, meteorological stations and observers, miscellaneous climatological data, crest stages of floods at Hartford, yearly maximum gage heights at Falls Village and at Jewett City, dates of earliest and latest snow in New Haven, time of flowering of fruit trees in New Haven, monthly and annual precipitation and

snowfall by stations, and frost records by stations. An index and list of 60 references are included.

Weather (*Rhode Island Sta. Rpt.* [1939], pp. 58, 59).—A brief summary of climatological data.

SOILS—FERTILIZERS

[**Soil investigations at the Alabama Station**] (*Alabama Sta. Rpt.* 1938, pp. 9, 10, 11).—This report notes work on elements required in small quantities for plant growth in soils, by A. L. Sommer; further studies of the influence of liming on boron availability in soils, by J. A. Naftel; and the leaching of potassium below the feeding zone of plants, by N. J. Volk.

[**Soil investigations by the Arizona Station**] (*Arizona Sta. Rpt.* 1939, pp. 29–38).—Data are reported on gypsum in irrigation water, soil erosion and rate of infiltration (coop. U. S. D. A.), distribution and activity of *Azotobacter* in Arizona soils, inoculation experiments with certain of the native Leguminosae, fertilizer requirement of citrus, acidulated fertilizers, sulfur placement, oxidation-reduction studies, and bound water in normal and puddled soils.

[**Soil investigations by the Rhode Island Station**] (*Rhode Island Sta. Rpt.* [1939], pp. 26–34).—These have included studies on the effect of crops on soil acidity, on the effect of chloropicrin in overcoming the influence of the previous crop, on optimum levels of nitrate nitrogen for vegetable crops, on the relative availability for plants of various compounds of magnesium, and on the relative rates of production of asparagine and of glutamine in beets and spinach as influenced by the calcium supply and the pH value of the medium.

[**Soil Survey Reports, 1934 and 1936 Series**] (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpts.], Ser. 1934, No. 18, pp. 39, figs. 2, maps 2; 1936, No. 3, pp. 78, figs. 6, map 1*).—These surveys were made in cooperation with the respective State experiment stations: 1934, No. 18, Uinta County, Wyo., T. W. Glassey, T. J. Dunnewald, and D. M. Stevens; and 1936, No. 3, Kaufman County, Tex., E. H. Templin and J. W. Huckabee, Jr.

A key to Kentucky soils, P. E. KARRAKER and W. S. LIGON. (Coop. U. S. D. A.). (*Kentucky Sta. Cir.* 51 (1940), pp. 36, fig. 1).—This key presents in a brief and logical arrangement the soil series that are known or thought with reasonable certainty to occur in Kentucky. It is expected to be of distinct service to workers in soils and related lines in the State in view of the fact that only a relatively small number of detailed surveys have been made in Kentucky, and most of these are so old that many of the soils involved have been reclassified since the surveys were made.

Relative infiltration and related physical characteristics of certain soils, G. R. FREE, G. M. BROWNING, and G. W. MUSGRAVE (*U. S. Dept. Agr., Tech. Bul.* 729 (1940), pp. 52, figs. 12).—The authors determined, by the tube method of Musgrave and Free (*E. S. R.*, 76, p. 303), the relative infiltration in situ of 68 soils from New York to New Mexico and from Georgia to Oregon.

Definite association of infiltration with all factors affecting pore size was found for the 68 soil sites. Particularly, noncapillary porosity, degree of aggregation, organic matter, and proportion of clay in the subsoil may be regarded as determinants of infiltration. Factors that determine the permanency of large pores, such as suspension percentage and dispersion ratio, were also associated with infiltration rates. Further, indications of correlations between soil properties that do not so directly affect infiltration were found in many of the data. Among these were the positive correlation between organic matter and moisture equivalent and between clay and moisture equivalent, the significant negative correlation between suspension percentage and pH value, and the

negative correlation between content of silt and clay and volume weight. These correlations were found to be in accord with the observations of numerous other workers and with well-recognized principles of soil physics. For maintaining or increasing the infiltration rate of field soils the study indicates the value of the commonly recommended soil-management practices, including the incorporation of organic matter and its maintenance at a reasonably high level, proper tillage practices, and a good cropping program. Conversely it is indicated that those practices tending to reduce the degree of aggregation, decrease the stability of aggregates, and increase the turbidity of water available for infiltration are usually conducive to a reduction in the rate of intake of natural rains.

Related studies conducted on 13 sites during the course of the main investigation covered by this report indicated that variation in turbidity of water available for infiltration was one of the most important factors tending to make infiltration rates determined by the rainfall-simulator method lower than those determined by the tube method. This and the fact that some lateral movement of subsurface water was observed for both these methods of determining infiltration rates, which involve the artificial application of water, suggest that these rates and others that are found when water is artificially applied should probably be considered relative rather than absolute, and that these values should always be considered as relative if used in the design of control measures.

Elements of life: A study of the effect of mineral differences on soils, plants, animals, living conditions, comparing the Central Basin area and the Highland Rim area (*Tennessee Sta. Pop. Bul. 1 (1940), pp. [17], figs. 14*).—Largely through illustrations, with but brief verbal statements, this bulletin shows the differences in nutrient content, and in crop-, livestock-, and profit-producing capacity between the phosphate-rich lands of the Central Basin and the Highland Rim lands containing less than one-sixth as much phosphate in the plow layer. A final set of illustrations and text points out the gradual depletion of the State's phosphate rock resources.

Arsenic distribution in soils and its presence in certain plants, K. T. WILLIAMS and R. R. WHERSTONE (*U. S. Dept. Agr., Tech. Bul. 732 (1940), pp. 20, fig. 1*).—For the determinations here reported the authors used a method in which the arsenic is separated from interfering elements by distillation with hydrobromic acid and determined colorimetrically by the molybdenum blue method.

Profile samples as well as surface soils alone from various great soil groups were examined. These soils, representative of widely separated areas, all contained arsenic in quantities varying from 0.3 to nearly 40 p. p. m. Soils from Mexico were found to have an arsenic content similar to that of soils of the United States. The arsenic content of widely varied vegetation growing on diverse soils was found to reach maximum values about 10 p. p. m. under normal conditions. Many samples contained less than 0.1 p. p. m. Some plants contain more than others growing on the same soil. Also, as a rule, roots contain more than tops of plants. Soils contaminated with arsenic may, in some cases, produce vegetation of an arsenic content higher than that found on any natural soil. In general, however, it appears that plant growth is limited by the presence of arsenic in soils before injurious quantities are absorbed. In a few marine algae examined, the arsenic content was found to range from 1 to 12 p. p. m.

No clearly defined relationship was found between arsenic content of soils and climatic conditions or geological formations on which the soils were developed.

Selenium occurrence in certain soils in the United States, with a discussion of related topics.—Fourth report, K. T. WILLIAMS, H. W. LAKIN, and H. G. BYERS (*U. S. Dept. Agr., Tech. Bul. 702 (1940), pp. 60, figs. 7*).—This bul-

letin reports the results of a survey of part of Montana which establish toxic areas in Big Horn, Yellowstone, Teton, Pondera, Chouteau, Fergus, Lewis and Clark, Cascade, Hill, and Judith Basin Counties. Indicator plants were used as guides in the survey work. *Astragalus pectinatus* was found to be a better absorber of selenium than *A. bisulcatus*. Radishes, peas, lettuce, spinach, beets, and squash raised in an irrigated garden on highly seleniferous soil in Lyman County, S. Dak., had selenium contents below the limits normally considered toxic for rats. An area in Utah was found to produce vegetation of sufficient selenium content to be toxic. A wide variation in the selenium content with geographical location was found in the Mobridge member of the Pierre shale. Certain portions of the Eagle Ford formation in Texas were found to contain significant quantities of selenium.

An extension of the examination (E. S. R., 79, p. 597) of the selenium content of sea-floor samples has shown that the floor of the Atlantic Ocean contains selenium from Halifax, Nova Scotia, to Falmouth, England. Data on seleniferous soils of Hawaii and Puerto Rico that do not produce toxic vegetation are given. Soil and vegetation samples collected near Fajardo, P. R., are given as a special example. Selenium has been established as the cause of a 200-year-old disease which occurs near Iraquato, Mexico. In addition to the examination of soils and vegetation collected over the area, vegetables from the public market were examined and found to contain from 0 to 70 p. p. m. of selenium.

Recent publications on topics related to the selenium problem are reviewed.

Mississippi soils are acid, or are becoming acid, C. D. HOOVER (*Miss. Farm Res. [Mississippi Sta.]*, 3 (1940), No. 8, pp. 1, 7).—The author considers that, for soils of a sandy texture which are quite acid an application of from 500 to 1,000 lb. of lime per acre broadcast will give immediate results, especially with legumes, while soils of a silt and clay texture will require from 1,000 to 2,000 lb. of lime per acre broadcast.

Neutral versus acid fertilizer, J. L. ANTHONY, J. PITNER, and C. DORMAN (*Mississippi Sta. Bul.* 338 (1940), pp. 15).—Although all Mississippi soils are acid or are becoming acid because of leaching, crop removal, erosion, and the use of acid-forming fertilizers, soils of a sandy texture responded favorably to the effect of lime in applications of fertilizer, whereas soils of a silt and clay texture responded but slightly or negatively to the lime used to neutralize acid fertilizers. The average response to neutral fertilizers on soils of a sandy texture was an increased yield of 90 lb. of seed cotton per acre in the 5-yr. experiment, 104 lb. in the 4-yr. experiment, and 72 lb. in the 3-yr. period. The weighted average increase on soils of a sandy texture was 83 lb. of seed cotton per acre. On the basis of these results, "1 ton of neutralized fertilizer applied on 5 acres of sandy textured soil would produce an increase over acid fertilizer of 450 lb. seed cotton."

Commercial fertilizers in Kentucky in 1939, H. E. CURTIS, J. D. TURNER, H. R. ALLEN, and L. GAULT (*Kentucky Sta. Regulat. Ser. Bul.* 22 (1940), pp. 55).—This contains the 1939 fertilizer analysis data and information designed to assist the farmer in using these figures.

AGRICULTURAL BOTANY

Abstracts of the papers presented before the physiological section of the Botanical Society of America, Columbus, Ohio, December 28 to 30, 1939 (*Amer. Jour. Bot.*, 26 (1939), No. 10, Sup., pp. 14-24).—Of interest to agricultural botany are the following: The Toxicity of Sulfanilamide in Tobacco, by E. L. Spencer; The Mineral Composition of Yeast Ash From Spectroscopic

Analysis, by O. W. Richards and M. C. Troutman; Glycoside Formation in Plants From Absorbed Ethylene Chlorohydrin, *o*-Chlorophenol, and Chloral Hydrate, by L. P. Miller; A Study of Cellular Changes and Dry Matter Content in the Growing Region of the Primary Root of Cowpea Seedlings, and Relation of Vitamin C to Cell Size in the Growing Region of the Primary Root of Cowpea Seedlings, both by M. E. Reid; Anatomy of the Starch Grain, by S. H. Eckerson; A Differential Volumeter for Micro-respiration Measurements, by K. V. Thimann and B. Commoner; Oxygen Intake and Carbon Dioxide Output of Dormant *Gladiolus* Bulbs, by N. C. Thornton and F. E. Denny; Respiration and Oxygen Requirements for Growth of *Nuphar aduncum* and Other Water Plants, by H. E. Laing; Hydrogen Assimilation in Green Plants, by H. Gaffron; The Relation Between Respiration and Catalase Based on Studies of Intact Dormant Seed and Seed With Certain Membranes Removed, by W. E. Davis (Kans. State Col.); Influence of the Velocity of Crystallization on the Freezing Point of Living Tissues, by B. J. Luyet and M. Sheeley; Differential Inhibition of Initiation and Development of Adventitious Buds of the Hypocotyl of Flax, by G. K. K. Link and V. Eggers; Factors Influencing Protoplasmic Streaming in the Ont Coleoptile, by R. A. Olson; Evidence Relative to the Supposed Permeability of Sieve-Tube Protoplasm, by O. F. Curtis and G. N. Asai (Cornell Univ.); Initial Water-Supplying Power of Different Kinds of Soil at Onset of Permanent Wilting in Wheat and Coleus, by B. E. Livingston and M. Wolf; The Drought Resistance of Some Western Grasses, by L. F. Bailey; Effect of Relative Humidity on Germination of Spores of Certain Parasitic Fungi, by C. N. Clayton (Univ. Wis.); Breaking the Dormancy of Buds of Pear Trees with Glutathione, by J. D. Guthrie; An Explanation of the Advantage of Alternating Temperatures Over Constant Temperatures in the Germination of Certain Seeds, by W. E. Davis (Kans. State Col.); A Rapid Method for Determining the Germinative Power of Some Hard-Coated, Dormant Seeds, by F. Flemion; The Development of Excised Maize Embryos in an Atmosphere of Nitrogen, by C. D. La Rue and J. Merry; Cause of Decreased Germination of Bean Seeds Soaked in Water, by H. C. Eyster; Germination of Seed of *Poa compressa* L. and *Poa pratensis* L. at Different Alternating Temperatures, by A. M. Andersen (U. S. D. A.); Growth of Cereal Plants From Dry and Soaked Irradiated Grains, by E. L. Johnson; Flower Production in *Digitalis* and *Crassula rubicunda* by Low Temperature and Light, by J. M. Arthur; The Absorption Spectra of Water Extracts of Several Species of Photosynthetic Purple Bacteria, by C. S. French; Use of the Dropping Mercury Electrode in Photosynthesis Studies with *Chlorella pyrenoidosa*, by W. E. Moore and B. M. Duggar, The Contribution to Photosynthesis of Light Energy Absorbed by Carotenoids in the Diatom *Nitzschia closterium*, by H. J. Dutton and W. M. Manning, and Effects of Monochromatic Ultraviolet Radiation on the Growth of Fungous Spores Surviving Irradiation, by A. E. Dimond and B. M. Duggar (all Univ. Wis.); Photochemistry and Absorption Spectroscopy of the Pyrimidine Component of Vitamin B₁, by F. M. Uber and L. A. Fourt, and Ultra-violet Inactivation of the Pyrimidine Component of Vitamin B₁, by F. Verbrugge and F. M. Uber (both Univ. Mo.); Effect of Light of Different Wave Lengths on Plant Growth, by F. W. Went; Effects of Light Quality on *Serratia marcescens*, by K. W. Kreitlow (La. State Univ.); Auxin Content in Ovaries and Young Fruits at Different Stages of Development, and Auxin Content in *Oenothera* and Its Host, both by F. G. Gustafson; Some Chemical Agents in the Production of Overgrowths on Plants, by M. Levine; The Relation Between Respiration, Protoplasmic Streaming, and Auxin Transport in the *Avena* Coleoptile, by H. G. du Buy and R. A. Olson, and Effect of Various Growth Regulating Substances on the Growth of Lettuce

Seedlings (Variety Grand Rapids), by R. B. Stephenson (both Univ. Md.); The Production and Inhibition of Adventitious Organs and Some Effects of Growth Substance Vapors, by P. W. Zimmerman and A. E. Hitchcock; Comparative Root-Inducing Activity of Individual Substances and Mixtures, by A. E. Hitchcock and P. W. Zimmerman; Further Studies on the Vegetative Propagation of Some Gymnosperms, With Indole Acetic Acid, by A. L. Delisle; The Hormone Content of Maize Endosperms as Determined by Different Extraction Methods, and Growth Hormones and Heterosis, both by G. S. Avery, Jr., H. B. Creighton, and B. Shalucha; Auxins of *Hyalopterus arundinis* and of Its Host, by G. K. K. Link and V. Eggers; Distribution of Auxin in Subtropical Fruit Plants, by W. C. Cooper and K. R. Knowlton (U. S. D. A.); Production of Auxin by Tobacco Callus Cultured in Vitro, by F. Skoog; Some Effects of Wounds and Wound Hormones, by C. D. La Rue; The Influence of the Stage of the Rest Period on Rooting at the Cut Surface of Potato Tubers, by J. D. Guthrie; Further Studies on Growth Substances in Relation to the Mechanism of the Action of Radiation on Plants, by H. R. C. McIlvaine and H. W. Popp (Pa. State Col.); Note Regarding Trimethylamine as a Plant Sex Hormone, by L. H. Flint and F. McGoldrick (La. State Univ.); Maintaining a High Potential Growth Rate in *Avena* Coleoptiles by Pre-treatment With Auxin, by C. L. Schneider; and Histological and Anatomical Changes Induced by Indole-Acetic Acid in Rooting Cuttings of *Pinus strobus*, by A. L. Delisle.

[Symposium papers on botany] (In *Cold Spring Harbor Symposia on Quantitative Biology*, VII. *Cold Spring Harbor, N. Y.; Biol. Lab., 1939, vol. 7, pp. 195-215, 260-268, 349-361, 377-393, figs. [35]*).—The following papers are of special interest to botany: The Relation Between the "Oxidation-Reduction Potential" and the Oxygen Consumption Rate of Yeast Cell Suspensions, by J. P. Baumberger (pp. 195-215); Enzymatic Breakdown and Synthesis of Carbohydrate, by C. F. Cori (pp. 260-268); Respiratory Enzyme Systems in Symbiotic Nitrogen Fixation, by R. H. Burris and P. W. Wilson (pp. 349-361); A Tentative Picture of the Relation Between Photosynthesis and Oxidation Reactions in Green Plants, by H. Gaffron (pp. 377-384); and Carbohydrate and Lipid Assimilation in Bakers' Yeast, by T. J. B. Stier (pp. 385-393).

[Botanical studies by the Arizona Station] (*Arizona Sta. Rpt. 1939, pp. 59, 60*).—A report regarding the completion of studies of the grass flora of the State, including 90 genera and 370 species, and on plant collections, identifications, and other taxonomic studies, including a note on the monographing of 78 species and 63 varieties of the genus *Ranunculus* occurring in North America.

[Agricultural botany in the Philippines] (*Natl. Res. Council Philippines Bul. 23 (1939), pp. 172, 173, 181, 203, 204*).—Abstracts are given of the following papers: Macrosporogenesis and Development of the Female Gametophyte of *Asparagus sprengeri* Regel, by J. K. Santos; Some Physiological and Anatomical Features of Corn Seedlings Grown in Nutrient Solution With and Without Nitrogen, by A. R. Pelfio; and A Study of Root Nodule Bacteria of Certain Leguminous Plants, by D. I. Aquino and A. L. Madamba.

[Plant physiology] (*Indian Sci. Cong. Proc. [Calcutta], 26 (1939), pp. 125, 126*).—Abstracts of the following papers are of interest: Phosphorus Nutrition of Wheat, and A Study on the Rate of Respiration in Relation to Nitrogen Metabolism of Potato Tuber, both by S. M. Sircar; and March of Transpiration of a Leaf From the Earliest Stage to Its Fall, by P. Parija and B. Samantarai.

Laboratory equipment for temperature and humidity control, G. F. MILES (*Agr. News Letter, 8 (1940), No. 4, pp. 50-52*).—Methods of research on the way environmental factors influence the effects of seed treatment chemicals on seed

viability are discussed. Results with treated and untreated lima bean seeds are used to show the value of laboratory tests in evaluating the usefulness of seed treatment materials under various temperatures, etc., in field or storage.

An electronic relay for heat control, A. C. HALL and L. J. HEDT (*Science*, 92 (1940), No. 2380, pp. 133, 134, fig. 1).—A simple and inexpensive electronic relay is described and illustrated which is said to control a bath temperature to 0.02° C. It requires only a 115-v. power source (A. C. or D. C.) and permits only a few microamperes to pass through the thermoregulator contacts.

A spatulate pipette serving as section lifter, E. M. SCHLEICHER (Univ. Ill.). (*Science*, 92 (1940), No. 2382, p. 182, fig. 1).—A glass tube with flattened lumen attached to a rubber bulb is used to suck in the microtome section along with some of the suspending fluid and to expel it gently onto the microscope slide.

An electron microscope for the research laboratory, V. K. ZWORYKIN (*Science*, 92 (1940), No. 2377, pp. 51-53, figs. 5).—Based on examination of the pictures so far obtained, it is estimated that the electron microscope described and illustrated possesses a resolving power 20 times that of the best light microscopes with oil immersion.

An osmic impregnation method for mitochondria in plant cells, E. H. NEWCOMER (Mich. State Col.). (*Stain Technol.*, 15 (1940), No. 3, pp. 89, 90, fig. 1).—A modification of the osmium tetrachloride Kolatchev method, long used in animal cytology.

Old Gruebler hematoxylin and eosin compared with current American stains, T. M. McMILLION (*Stain Technol.*, 15 (1940), No. 3, pp. 119, 120).

The use of plastic as a substitute for cover glasses, V. SUNTZEFF and I. SMITH (*Science*, 92 (1940), No. 2375, pp. 17, 18).—Of a number tested, the solution found suitable was approximately 1 part of isobutyl methacrylate polymer to 2.5 parts of xylol. Under these conditions the drying required no more than a day, and thus far no curling of the plastic cover slips has occurred.

Evaluation of isobutyl methacrylate polymer as a mounting medium, R. A. GROAT (Univ. Wis.). (*Science*, 92 (1940), No. 2386, p. 268).—Some of the shortcomings of this medium are discussed.

The use of outline maps on herbarium labels, E. C. ABBE and D. B. LAWRENCE (Univ. Minn.). (*Science*, 92 (1940), No. 2382, pp. 181, 182, fig. 1).—The described inclusion of an outline map of the collecting area on the printed specimen label and marking on it the exact location where the specimen was collected leads to precision in recording the source locality of natural objects with little additional cost in time or money.

A method for stamping serial numbers on celloidin sections, G. L. RASMUSSEN (*Stain Technol.*, 15 (1940), No. 3, pp. 113, 114).—The procedure used with India ink and a rotating rubber stamp, such as a dime-store stamp with the year and month hands removed, is described.

Inexpensive microphotographic records, J. F. McCLENDON (*Science*, 92 (1940), No. 2380, p. 134).—An adaptation of the Univex camera, without destroying the lens or using up the entire film for one photomicrograph.

Shadowgraph recording of Avena coleoptile curvatures, H. G. ALBAUM and S. KAISER (*Science*, 92 (1940), No. 2379, p. 114, fig. 1).—The advantages of growing out in battery jars for the Went coleoptile assay method are noted, including the ease with which shadowgraph records may be obtained with a simple device described and illustrated.

Avena coleoptile assay of ether extracts of aphids and their hosts, G. K. K. LINK, V. EGGEES, and J. E. MOULTON (*Bot. Gaz.*, 101 (1940), No. 4, pp. 928-939).—Ether extracts of the aphids *Hyulopterus arundinis*, *Aphis maidis*, and

Brevicoryne brassicae and of their respective hosts, *Phragmites communis*, *Zea mays*, and *Brassica oleracea*, consistently produced negative curvatures in the *Avana* coleoptile test, extracts of cabbage aphids and leaves being active in amazingly high dilutions. Residues of equal samples of aphid and host extracts were not equally active. Extracts of the aphids *H. arundinis* and *Brevicoryne brassicae* and of the hosts *P. communis* and *Brassica oleracea* each contained a fraction active after acid, and another active after alkali, hydrolysis. The results were characterized by lack of proportionality between the amount of sample extracted and the activity of the residue of the ether extract in agr. Distillates from the extracts of cabbage leaf and aphid contained substances active in the coleoptile test. Dry residues of the extracts of cabbage leaf and aphid were active after 6 days' storage and also after 13 days' storage in the dark at 0° C., following a second solution in ether and evaporation to dryness. Better proportionalities between concentration and activity were obtained when the extracts were not evaporated to dryness.

Criteria for purity of chlorophyll preparations, G. MACKINNEY. (Univ. Calif. et al.). (*Jour. Biol. Chem.*, 132 (1940), No. 1, pp. 91-109, fig. 1).—In this paper the author reports "the values of absorption coefficients for several preparations of chlorophylls a and b. The coefficients from five different laboratories are so incompatible that their application to spectroscopic assay of the green pigments is useless, until independent verification yields acceptable standards. As an aid to this, and to the correct evaluation of our preparations, we consider methods in some detail, our procedure being considerably simplified. This is particularly true of the step involving the precipitation of chlorophyll from petroleum ether. As criteria for purity, correct analyses and the various tests, phase, cleavage, etc., are of course essential. When we then apply the highly sensitive spectroscopic method, we find, in the last analysis, that purity is assured only when the pigment is homogeneous and forms an entirely separate zone on the Tswett column. The means to this end depend on the selection and standardization of the adsorbent."

Some difficulties encountered in the extraction of growth hormones from plant tissues, F. G. GUSTAFSON (*Science*, 92 (1940), No. 2386, pp. 266, 267).—Experimental comparisons of various methods of extraction are briefly presented.

Regeneration and vegetative propagation, C. F. SWINGLE (U. S. D. A.). (*Bot. Rev.*, 6 (1940), No. 7, pp. 301-355).—In this comprehensive review (287 references), the first part deals with various anatomical, physiological, and practical reports on regenerative and propagation problems apart from growth substances; the second part considers various theoretical and practical problems tied up with those materials; and finally some consideration is given to more or less miscellaneous studies (some of which involve application of growth substances) on the lower plants and on leaf cuttings.

Origin of adventitious shoots in decapitated cranberry seedlings, H. F. RAIN. (U. S. D. A.). (*Bot. Gaz.*, 101 (1940), No. 4, pp. 872-880, figs. 15).—"The cranberry belongs to the increasing list of plants for which hypocotyledonary regeneration of growing points has been demonstrated. Adventive shoots in severed cranberry hypocotyls originate in the epidermal cell layer."

Rôle of glutathione in the breaking of the rest period of buds by ethylene chlorohydrin, J. D. GUTHRIE (*Contrib. Boyce Thompson Inst.*, 11 (1940), No. 4, pp. 261-270, figs. 2).—Treatment of freshly harvested potato tubers with solutions of glutathione shortened the rest period, this effect being about the same as that of ethylene chlorohydrin treatments including a similar glutathione content of the tissues. Injection of glutathione solutions into pear and peach branches shortened the rest period of the buds. It thus appears that ethylene

chlorohydrin breaks the rest period by increasing the glutathione content of the tissues.

Induced formation of β -gentiobiosides in gladiolus corms and tomato plants treated with chemicals, L. P. MILLER (*Science*, 92 (1940), No. 2376, pp. 42, 43).—The preliminary results here reported appear to indicate that gentiobiose is more widely distributed in plants than was previously supposed (see below).

Formation of β -o-chlorophenyl-gentiobioside in gladiolus corms from absorbed o-chlorophenol, L. P. MILLER (*Contrib. Boyce Thompson Inst.*, 11 (1940), No. 4, pp. 271-279, fig. 1).—"When gladiolus corms are treated with o-chlorophenol, the absorbed o-chlorophenol is converted into a β -glycoside. Through the synthesis of β -o-chlorophenyl-gentiobioside heptaacetate and heptapropionate, which were found to be identical with the corresponding derivatives of the glycoside formed in the treated corms, this glycoside has been shown to be β -o-chlorophenyl-gentiobioside. Since gladiolus corms had previously been found to form β -2-chloroethyl-d-glucoside from absorbed ethylene chlorohydrin, the results show that in the same plant tissue the sugar component of glycosides arising as a result of the absorption of chemicals which serve as aglucons may differ with different chemicals."

Auxin in marine plants, II, J. VAN OVERBEEK (*Bot. Gaz.* 101 (1940), No. 4, pp. 940-947).—In further studies (E. S. R., 83, p. 318), auxin was found in practically all the marine plants (brown and red algae, diatoms, *Phyllospadix*, *Zostera*, etc.) analyzed during the summer of 1939, details of which are given.

Effect of naphthalene acetic acid on mobile auxin in bean seedlings, W. S. STEWART. (U. S. D. A.). (*Bot. Gaz.*, 101 (1940), No. 4, pp. 881-889, fig. 1).—"In 7-day-old bean seedlings, applications of a 2 percent lanolin paste of naphthalene acetic acid applied as a band 1-2 mm. wide around the middle of the first internode caused in less than 2 hr. an increase in the amount of mobile auxin in the terminal bud, internode, and hypocotyl. The treatment likewise established a new gradient of mobile auxin. It also increased the ether-extractable auxin (which includes the mobile auxin) in the first internode. Ether extractions of bean seedlings showed large amounts of auxin in the terminal bud, while in other parts of the plant a substance was found capable of causing *Avena* coleoptile growth inhibition."

Enzymatic liberation of auxin from plant tissues, F. SKOOG and K. V. THIMANN (*Science*, 92 (1940), No. 2377, p. 64).—Using *Lemna minor* and the standard *Avena* test, the results obtained by several methods indicated that the slowness of auxin extraction is due to its very gradual liberation from some bound form. It is concluded from this study that the auxin in *Lemna* is bound to a protein, from which it is liberated on hydrolysis. It is deemed probable that this conclusion applies to a variety of plant tissues.

A new application of chemistry to plant improvement [trans. title], A. LEVAN (*Sveriges Utsädesför. Tidskr.*, 50 (1940), No. 2, pp. 66-76, figs. 4).—A review of work with colchicine in the development of new plant forms.

Growth response of plants to riboflavin and ascorbic acid, R. DENNISON (*Science*, 92 (1940), No. 2375, p. 17).—Grown in silica gravel with Withrow's solution, riboflavin increased the growth of eggplant and ascorbic acid that of tobacco. The data also suggested definite species differences in response to riboflavin and ascorbic acid, as well as the marked stimulatory effect of riboflavin not previously reported.

Growth substances for fungi.—II, Critical survey of literature 1936-37, V. G. LULLY. (W. Va. Expt. Sta.). (W. Va. Univ. Bul., 40 ser., No. 5-I (1939), pp. 72-78).—A continuation (E. S. R., 79, p. 175), with 28 literature references.

Mutations and reversions in reproductivity of *Aspergilli* with nitrite, colchicine and *d*-lysine. R. A. STEINBERG and C. THOM. (U. S. D. A.). (*Natl. Acad. Sci. Proc.*, 26 (1940), No. 6, pp. 363-366).—Continuing such studies (E. S. R., 83, p. 177), the ease with which "mutants" were induced by nitrite suggested that its effect might consist in the destruction of a varying number of free amino groups included in the hereditary mechanism. In attempting to test this theory various compounds were used, among them *d*-lysine and sodium thiosulfate, both of which induced reversion mutants showing partial to complete recovery of reproductivity in *Aspergillus niger*. Positive results were also obtained with colchicine in several *Aspergilli*. In all these tests the nutrient solutions contained excess calcium carbonate. The mechanisms and implications of these responses are discussed. "An important, if not most important role is here assigned to *d*-lysine in the process of differentiation and reproduction, and concomitantly as a possible basis for strain differences in fruitfulness and certain growth characteristics. Progressive increase in sterility in successive transfers of fungi may, in some instances, have its origin in this process and may be found possible of counteraction in the presence of excess calcium carbonate by means of *d*-lysine or of ammonium salt and thiosulfate."

Glycine—an essential factor for the growth of bacteriophage. E. L. ELLIS and J. SPIZIZEN (*Science*, 92 (1940), No. 2378, p. 91).—Bacteriophage was found to multiply in bacterial cells suspended in dilute glycine solutions. Failure in distilled water and other pure solutions tested (as distinguished from broth) is ascribed to the necessity of specific substrates for phage growth.

Bacteriophage of *Rhizobia* in relation to symbiotic nitrogen fixation by alfalfa. S. C. VANDECAVEYE, W. H. FULLER, and H. KATZENELSON. (Wash. Expt. Sta.). (*Soil Sci.*, 50 (1940), No. 1, pp. 15-27, pls. 2).—*Rhizobium*-phage infected soil placed in pails and treated variously with *Rhizobium*-phage in fluid cultures and with phage-resistant and -susceptible strains of *R. meliloti*, used (3½ yr.) for growing alfalfa, gave normal growth and yields the first year (1936), but declined beginning in the second year. Additions of nitrogenous fertilizer in the third year to two series after the first alfalfa cutting (which lacked vigor and yielded poorly regardless of previous treatments) resulted in greatly improved vigor and nearly threefold increase in yield. Another application after the second cutting had even more striking effects. On the other hand, phosphate and potash fertilizers added to one of the fertilized series as supplements to nitrogen had no beneficial effects. Soil samples taken from various pails in 1937 and 1938 readily revealed a very active phage, the potency of which was high regardless of previous applications of *Rhizobium*-phage or phage-resistant or -susceptible *R. meliloti* to the soil. When the phage-resistant strain of *R. meliloti* was used as soil inoculant, it had no appreciable beneficial effect on alfalfa growth.

The presence of phage in the nodules of plants grown on infected soil was demonstrated by lysis tests and by disintegration and granulation of *Rhizobium* cells as revealed in stained smears of crushed nodules. Careful examination of representative alfalfa plants from variously treated soils failed to disclose symptoms of disease. These factors being eliminated, the only logical factor accountable for the poor growth in these tests was the action of the *Rhizobium*-phage resulting in lysis of *R. meliloti* and in a consequent drastic reduction of symbiotic nitrogen fixation. Some of the complicating factors that should be considered in relation to the *Rhizobium*-phage problem are briefly discussed.

The growth metabolism of *Rhizobium*, with evidence on the interrelations between respiration and synthesis. S. R. HOOVER and F. E. ALLISON. (U. S. D. A.). (*Jour. Biol. Chem.*, 134 (1940), No. 1, pp. 181-192, figs. 5).—Essentially the only products formed by *R. meliloti* growing in cultures supplied with am-

monia and nitrate N were CO_2 , H_2O , and bacterial cells of nearly constant composition with respect to age of culture and N source. The $\text{Q}_{100}\text{Q}_{10}$ was analyzed graphically, and empirical equations were established describing the basal respiration and synthetic growth reactions occurring. A theoretical maximum growth efficiency or economic coefficient was calculated from the findings. Direct determinations of economic coefficient by two methods agreed well with the theoretical value.

Boron as a plant nutrient: A bibliography of literature published and reviewed, January 1939 through December 1939 (with index), I. H. JAMESON and C. M. SCHMIDT (Washington, D. C.: Amer. Potash Inst., Inc., 1940, Sup. 2, pp. [2]+81+XVIII).—Additions to the bibliography previously noted (E. S. R., 81, p. 768).

Absorption of selenium and arsenic by plants from soils under natural conditions, O. E. OLSON, L. L. Sisson, and A. L. MOXON. (S. Dak. Expt. Sta.). (Soil Sci., 50 (1940), No. 2, pp. 115-118).—Analyses of several soil and plant samples indicated no correlation between Se and As contents of the soils. The As in the soils studied was considerably less available to plants than the Se.

Vitamin B₁ in relation to the growth of green plants, D. I. ARNON. (Univ. Calif.). (Science, 92 (1940), No. 2386, pp. 264-266).—Evidence is presented that several widely differing plant species, when grown from seed under carefully controlled but favorable conditions, are not limited in their growth by an inherently low rate of vitamin B₁ synthesis, nor do the results indicate that such plants can benefit from additions of this vitamin to an otherwise favorable medium. However, the beneficial effects of vitamin B₁ on the rooting of certain cuttings is not inconsistent with these findings, since cuttings are not characterized by the storage of nutritive and growth substances to the extent observed in seeds.

Fungi for thiamin (vitamin B₁) assay, V. G. LILLY. (W. Va. Expt. Sta.). (W. Va. Univ. Bul., 40, ser., No. 10-1 (1940), pp. 72-77).—The author reviews the literature on thiamin assay fungi to May 1939 (26 references), and establishes the standard curve for *Phytophthora erythroseptica* which is shown to be suitable for thiamin assay. The possibility of using *Mucor ramannianus* on solid media for assay is also presented.

The relationship of inositol, thiamin, biotin, pantothenic acid, and vitamin B₆ to the growth of yeasts, R. J. WILLIAMS, R. E. EAKIN, and E. E. SNELL (Jour. Amer. Chem. Soc., 62 (1940), No. 5, pp. 1204-1207, figs. 3).—Growth curves of three highly different strains of *Saccharomyces cerevisiae* cultured in media containing different combinations of growth substances indicated that at least two strains could grow continuously without inositol, and that thiamin was especially important for only one. Biotin alone would not immediately stimulate the yeast growth from small seedlings, but in proper combination its effect was striking and evident even in very minute doses. Pantothenic acid or its precursor β -alanine was highly essential for immediate growth, and when added alone was able to induce continued growth. Vitamin B₆ proved relatively unimportant as a constituent of the media. Substances of unknown nature in liver and yeast extracts play an important role in promoting rapid growth. Yeasts during a long incubation period show considerable ability to grow in the absence of various nutritives, and under such conditions one nutritive alone may serve, whereas for rapid growth several are necessary.

The efficacy of ultra-violet light sources in killing bacteria suspended in air, B. A. WHISLER (Iowa State Col. Jour. Sci., 14 (1940), No. 3, pp. 215-231, figs. 8).—The bacterial killing power of ultraviolet irradiation varied directly with the time of exposure to it and with the light intensity. The bactericidal

effects may be expressed as simple mathematical relationships. The killing effect was 10 or more times as effective in dry as in humid air. Use of glass filters indicated that over 94 percent of the killing effect of the quartz mercury arc lies in the spectrum region below 280 m μ . For a given high pressure quartz mercury arc, the killing power varied as the fourth power of the voltage drop across the lamp. The efficiencies as to power consumption v. bactericidal power of several types of apparatus are compared. Among different bacterial genera there were great variations in resistance to such irradiation.

General bacteriology, D. B. SWINGLE (*New York: D. Van Nostrand Co., 1940, pp. XII+313, [pl. 1], figs. 157*).—A textbook comprising a general introduction to the field, in which the author attempts to present a thorough study of the organisms themselves as a basis for applied work.

Elementary bacteriology, J. E. and E. O. GREAVES (*Philadelphia and London: W. B. Saunders Co., 1940, 4. ed., rev., pp. XIV+587, [pls. 6], figs. [158]*).—This textbook, in its 48 chapters, considers the history and fundamentals of bacteriology and the more important nonpathogenic and pathogenic bacteria.

Fundamentals of bacteriology, M. FROBISHER, JR. (*Philadelphia and London: W. B. Saunders Co., 1940, 2. ed., rev., pp. XVII+653, [pls. 3], figs. [323]*).—A revised edition of the textbook previously noted (*E. S. R., 77, p. 694*).

Bactericidal filtrates from a mold culture, E. C. WHITE (*Science, 92 (1940), No. 2380, p. 127*).—A mold, tentatively identified as *Aspergillus flavus*, growing readily in liquid media was found to yield filtrates that are definitely bactericidal for some gram-negative as well as gram-positive bacteria. Other *Aspergillus* forms examined in this way have given widely varying results.

Germination of chlamydospores of *Cintractia leucoderma* [trans. title], A. P. VIEGAS (*Jor. Agron., 3 (1940), No. 1, pp. 33-42, pls. 2*).—A cultural and cytological study of the fungus.

A new species of *Hypocrella* [trans. title], H. P. KREB (*Jor. Agron., 3 (1940), No. 1, pp. 69-82, pls. 5; Eng. abs., p. 80*).—The fungus *H. fluminensis* n. sp., occurring on aleyrodids, is described.

The Myxomycetes, G. W. MARTIN (*Bot. Rev., 6 (1940), No. 7, pp. 356-388*).—The slime molds have been known and studied for over two centuries. Quite naturally, the earlier references to the group are almost entirely taxonomic. A full review of that literature is beyond the present scope, which includes critical analyses of the questions of spore germination, nutrition and culture, morphology and cytology of the fructifications, nuclear cycle, physiology, ecological relations, and the more recent taxonomic problems of the group. In the light of present information, it is deemed best to restrict the name Myxomycetes to include only the Exosporeae, represented by the single genus *Ceratomyxa*, and the Myxogastres (Endosporeae). There are 203 references.

A second note on Georgia Discomycetes, E. K. CASH. (U. S. D. A.). (*Jour. Wash. Acad. Sci., 30 (1940), No. 7, pp. 299-305, figs. 4*).—New species are described under the genera *Sphaeropeziza*, *Lachnum*, *Pyrenopeziza*, and *Phaeangium*.

Effect of emanations from several species of fungi on respiration and color development of citrus fruits, J. B. BIALLE. (Univ. Calif.). (*Science, 91 (1940), No. 2367, pp. 458, 459, fig. 1*).—This is a preliminary report.

Alcoholic fermentation by *Fusaria* juice obtained with a wet crushing mill, J. C. WIRTH and F. F. NORD (*Science, 92 (1940), No. 2375, p. 15*).—The authors investigated an artificial enzyme system from *Fusarium Uni* extracted by the aid of the Booth-Green wet crushing mill noted on page 10. The measurable capacity of the juice at 28° [C.] amounted to $\pm 35-40$ percent of the phosphorylation in the living cell system. In some cases this appeared

to have been preceded by a dephosphorylation of the organic phosphate donors originally present in the living cells. The esterification brought about by the quantity of inorganic phosphate present amounted to $\pm 3-4$ percent. The quantity of CO_2 obtained by action of the zymases compared favorably with that of the living system. This enzyme system exhibited none of the deficiencies or distortions of the usual maceration juices obtained from yeasts.

The herbaceous vegetation of the Edwards Plateau, V. L. CORY. (Tex. Expt. Sta.). (*Southwest. Sheep and Goat Raiser*, 10 (1940), No. 10, pp. 5, 6, 34, 35).—In this Texas plateau region—beginning in May 1931 and ending in December 1936—vegetation counts were made at several stations in the turf grasslands at each ranch by means of meter quadrats, selected and counted once or twice each month throughout the period of 5.5 yr. In no two years was the herbaceous vegetation of the range exactly alike. The stable elements were the perennial grasses, while the greatest variation from year to year was with the forbs. Detailed information is presented concerning the species of economic importance in the latter group.

Common range plants (Arizona and New Mexico), G. B. ARTHUR (U. S. Dept. Int., Civ. Conserv. Corps, P. T. Ser. No. 13 (1939), pp. [6]+118, figs. 35).—This illustrated manual is designed primarily to assist range survey personnel in the identification and study of important plants. It is divided into grasses, browse plants, and weeds, each of these sections being preceded by an index, by common and Latin names, of the plants described therein. Palatability ratings are given for each of the range species, and keys to the genera are provided.

The floristic significance of shrubs common to North and South American deserts, I. M. JOHNSTON (*Jour. Arnold Arboretum*, 21 (1940), No. 3, pp. 356–363).—In the southwestern United States and northern Mexico (in North America) and in Argentina and Chile and adjacent Bolivia and Peru (in South America) there are vast areas characterized by a low atmospheric humidity and rainfall. The climatic and edaphic conditions of these two regions are rather similar and so is their general type of vegetation. Though their component species are almost entirely different, there are identities which indicate former connections and interchange, and there is every reason for believing in the past existence of a widely distributed American desert flora. All the evidence indicates that, relatively isolated and free from competition, it has persisted in South America, while in North America, diluted by new xerophytes originating in the northern temperate lands, it has been giving way before their competition. Certain northern desert shrubs are deemed the remnants of an old desert flora which has found a haven in South America, but has been decimated in the more keenly competed desert terrains of the north.

Wood anatomy and pollen morphology of *Rhus* and allied genera, C. HEIMSCH, JR. (*Jour. Arnold Arboretum*, 21 (1940), No. 3, pp. 279–291, pls. 3).—A detailed study of the secondary xylem and the pollen grains of the *Rhus* group of plants (genera *Rhus*, *Cotinus*, *Tosiodendron*, *Metopium*, *Malosma*, and *Actinochetta*) indicated that on the basis of each of these structures plants of the *Rhus* complex are segregated into the same six groups. Whether these should be considered as genera or subgenera is a matter of interpretation. However, the xylem structure here is distinctive. Thus, in a relatively small taxonomic group such as this, anatomical studies can provide data significant for classification.

The physiology of trees with special reference to their food supply, A. J. HEINICKE. (Cornell Univ.). (*Natl. Shade Tree Conf. Proc.*, 15 (1939), pp. 26–35).—A brief conspectus of the subject.

Solution gardening: A new application of science to an ancient art, B. E. LIVINGSTON (*Sci. Mo.*, 51 (1940), No. 1, pp. 15-21).—A semipopular summary of the practical application of mineral nutrient supply to plants in solutions, with brief reviews of eight recent popular books on the new "gardening" method.

Sketch of the development of the water culture method of growing plants, J. W. SMITH (Rutgers Univ.). (*Sci. Mo.* 51 (1940), No. 3, pp. 233-240).—A review (bibliographical footnotes) of progress from the eighteenth century on.

The mechanism of plant respiration, H. HIBBERT (*Jour. Amer. Chem. Soc.*, 62 (1940), No. 4, pp. 984, 985).—A preliminary note.

An attempt to record internal tree-trunk pressures, A. P. BELMANN (*Ann. Missouri Bot. Gard.*, 27 (1940), No. 3, pp. 365-370, pl. 1, fig. 1).—Using an automatic "dash-pot" instrument developed for the purpose, the records obtained either from the back of glass-fronted cavities or from bore holes in sound tree trunks showed clearly that the so-called "internal pressures" were due to temperature changes within the instrument. When a mass of putty replaced the tree trunk, identical records were obtained. Internal pressures—if they exist—cannot be recorded either with manometers or with the instrument described. Fluctuating barometric pressures of stormy periods were simulated by applying pressure or suction forces to a tree trunk. With the equipment used it was found that suction forces were the easier to obtain. Equilibrium, following evacuation, was so quickly established that accurate measurements could not be made. It was physically impossible to read manometers placed 1 m. apart from top to bottom of a mature tree. The "lag" in establishing equilibrium was shown to be ± 90 sec. for a certain Spanish oak. From these results it appears that "internal pressure" differing from atmospheric does not occur in normal sound trees.

Studies on the developing cotton fiber.—II, Identification and estimation of the reducing sugars, J. COMPTON and F. E. HAVER, JR. (*Contrib. Boyce Thompson Inst.*, 11 (1940), No. 4, pp. 281-290).—Continuing this series (E. S. R., 83, p. 605), it was found that "the reducing sugars of developing cotton fibers are composed of glucose, fructose, and pentoses. Throughout the period of fiber development the sugars are present in variable relative proportions. During the period of rapid cell wall elongation, 1 to 20 days, the reducing sugar component is high relative to the mass of the crude fiber, but progressively decreases during cell wall thickening, 'secondary wall formation,' until maturity is reached. The mechanism of the transformation of the various sugars into the many cotton fiber constituents lies as yet in the realm of speculation." There are 26 references.

The course of photosynthesis and fluorescence, E. D. McALISTER and J. MYERS (*Science*, 93 (1940), No. 2385, pp. 241-243, figs. 4).—Using wheat and *Chlorella pyrenoidosa*, it was found that the behavior observed in several hundred induction curves, obtained over a wide range of conditions, may be described in terms of two processes. One of them involves an inverse relation between the rate of CO₂ uptake and the intensity of inflorescence, and the other a direct relation. As to the nature of these processes, more study is needed.

The time course of photosynthesis and fluorescence observed simultaneously, E. D. McALISTER and J. MYERS (*Smithson. Misc. Collect.*, 99 (1940), No. 6, pp. [2]+37, figs. 16).—Simultaneous measurements of intensity of fluorescence and rate of CO₂ assimilation during and following the induction period in wheat and *Chlorella* are reported. Although these observations are regarded as exploratory and preliminary, they are believed to permit of certain

conclusions, which are discussed. Briefly, these are: Any sudden change in illumination conditions or CO₂ concentration that produces a large increase in the photosynthetic rate also gives rise to a "burst" in the intensity of fluorescence. The changes in CO₂ assimilation rate observed in the induction period of wheat under normal air conditions are caused by two processes, one of which exhibits an inverse relation to intensity of fluorescence and the other is directly related. In *Chlorella* the induction behavior is greatly influenced by the previous conditions of culture. Under CO₂ concentrations greater than that of normal air the induction phenomenon in wheat is complicated by a second maximum in fluorescence occurring after ± 1 -min. illumination. At the same time a minimum in CO₂ uptake rate is observed which clearly bears an inverse relationship to this second maximum of fluorescence. Curves relating intensity of fluorescence and CO₂ uptake rate to incident intensity were obtained from measurements made under steady-state conditions following the induction period. These show a marked change in fluorescence in passing from light-limiting to CO₂-limiting conditions. The CO₂ assimilation rate in wheat in high light and 0.08 percent CO₂ is 80-50 percent higher in 0.5 than in 20 percent O₂, suggesting that for young wheat a reaction of large proportions opposing photosynthesis is always depressing the CO₂ assimilation rate under natural growing conditions.

Sex expression in willows, E. C. SMITH. (Colo. State Col.). (*Bot. Gaz.*, 101 (1940), No. 4, pp. 851-861, figs. 4).—"Dioeciousness in willows probably expresses a terminal condition or climax in an evolutionary process which is impressed to a high degree on the germ plasm. The potentialities for the expression of both sex tendencies are present in all individuals of the genus, but expression of one of them is ordinarily in nature inhibited by the genetic constitution. Whether this is due to an inhibiting factor, to a realizator factor, or to a varying balance between genes and autosomes is not yet clear. Whatever accounts for the dioecious character, some of the variations from that condition are demonstrably due to external agents; others are just as demonstrably due to internal changes. Under the natural conditions in which willows occur, triploidy and polyploidy are common results of hybridization, but occur also in pure lines. In some cases, but not in all, these conditions bring about various abnormalities of sex expression. Even though the underlying causes are in the germ plasm, the action at the point of segregation for stamens and pistils is that of the hormones, and that action may be modified by external factors."

GENETICS

The breeding of improved selfed lines of corn, H. K. HAYES and I. J. JOHNSON. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 31 (1939), No. 8, pp. 710-724).—"Inbred lines were bred by the pedigree method from crosses between inbreds where, as a rule, one parent at least of each cross was outstanding in resistance to lodging and to smut. Selection during the segregating generations was made in selfed lines for these characters and for plant vigor. In general, the methods used appeared to lead to distinct improvement in many characters. When the inbreds produced by the pedigree method were studied in inbred-variety crosses, lines of good combining ability were obtained oftener from crosses between good combining inbreds than from crosses between inbreds low in combining ability, suggesting that this character is inherited. Twelve characters of the inbreds, by means of total correlations, were found to be related significantly to yielding ability in inbred-variety crosses. The correlations ranged from +0.1902 for tassel index of inbreds and yield of inbred-variety crosses to +0.5430 for root volume of inbreds and yield of inbred-

variety crosses. A multiple correlation coefficient of 0.6660 was obtained for association between yield of inbred-variety crosses and characters of inbred lines, including date silked, plant height, ear height, leaf area, pulling resistance, root volume, stalk diameter, total brace roots, tassel index, pollen yield, yield index, and ear length. Inbreds of good combining ability were selected from inbred-variety crosses. When F_1 combinations of these inbreds were studied in groups, group I crosses with no parents in common were superior to those of group II with one parent in common and far superior to group III, those with two parents in common.

The value in hybrid combinations of inbred lines of corn selected from single crosses by the pedigree method of breeding, I. J. JOHNSON and H. K. HAYES. (Minn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 7, pp. 479-485).—A study made to determine the relation between the performance of inbreds in inbred-variety crosses and in single crosses is reported. Evidence from 12 single crosses between relatively low-combining inbreds (bred by the pedigree method from single crosses) indicated that single crosses between low combiners may be expected to average somewhat lower in yield than single crosses from relatively high-combining inbreds when the single crosses are between inbreds of diverse genetic origin. Single crosses between low-combining inbreds with high combiners yielded as well, however, as single crosses between high combiners, and provided as high a proportion of high-yielding single crosses. Additional data from crosses between related inbred lines showed that diversity in genetic origin is an important factor in obtaining maximum expression of hybrid vigor. In a comparison of 147 single crosses between inbreds of unrelated origin with recommended double crosses, 63 yielded significantly higher than double crosses used as a standard, suggesting the desirability of selecting inbreds for use in double crosses from crosses between inbred lines with superior characters. See also a note by Wu (*U. S. R.*, 83, p. 325).

Genetic studies with foxtail millet, *Setaria italica* (L.) Beauv., H. W. LI, J. C. MENG, and C. H. LI (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 6, pp. 426-438, fig. 1).—From studies of progenies grown at Honan University (Kaifeng), six color types for the seed coat of foxtail millet were assigned the following factors: Black KRB , tawny buff KRb , korra buff KrB and Krb , sepia kRB , red kRb , and tawny red krB and krb . Endosperm characters are controlled by simple Mendelian factors, i. e., nonwaxy Wx , white W , waxy wx , and yellow w , with wx and w inherited independently. Earhead types may be palmatic or normal and are controlled by duplicate factors, P_1 and P_2 , as follows: Palmatic P_1P_1 and P_1p_1 , and normal p_1P_1 and p_1p_1 . Double earheads did not appear to be inherited.

Dormancy in fatuoid and normal oat kernels, F. A. COFFMAN and T. R. STANTON. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 6, pp. 459-466, fig. 1).—Freshly harvested seed of fatuoid and normal oats plants from 12 varieties of *Avena sativa* and 4 of *A. byzantina* were tested to determine the relationship in dormancy between fatuoid and normal plants of the same variety. When dormancy occurred in normal plants of a variety, it also occurred in fatuoids from that variety, and when germination was prompt, seed of the fatuoid of either the homozygous or heterozygous intermediate plant forms also germinated promptly. This seemed to support the belief that fatuoids result from mutations rather than from natural crosses with *A. fatua*, inasmuch as seed of the latter usually have a decided tendency toward dormancy. There also were indications that characters associated with fatuoids, such as the "suckermouth" form of base, presence of basal hairs on the callus,

etc., were unrelated to dormancy in oats. The authors (El. S. R., 79, p. 619) observed previously that these kernel characters were often found in oats varieties having a tendency to dormancy, but stated that their association with dormancy might be merely accidental.

Cytological investigations in *Desmodium* and *Lespedeza*, J. O. YOUNG (Bot. Gaz., 101 (1940), No. 4, pp. 839-850, figs. 43).—The haploid number 11 is reported for the chromosomes of 15 species, and the diploid number 22 for 9 species of *Desmodium*. Gametic numbers observed in *Lespedeza* were 11 for 1 species, 10 for 7 species, and 9 for 3 species. Where the haploid number 9 is reported, the presence of 20 chromosomes in root-tip metaphases indicates that the true gametic number is 10. Diploid numbers reported are 20 for 6 species and 1 variety, and 22 for 2 species. In both genera the chromosomes were $\pm 1\mu-3\mu$ in length. Pollen grains exhibited size variation in possibly hybrid species of *Lespedeza*, but no cytological abnormalities were noted. The anthers of *L. capitata velutina* had withered before anthesis in material from 2 widely separated localities, and only a few unusually small pollen grains were found.

The wild bean *Phaseolus polystachyus* (L.) B. S. P.: Its chromosome number, H. A. and H. F. ALLARD. (U. S. D. A.). (Jour. Wash. Acad. Sci., 30 (1940), No. 8, pp. 335-337).—Field notes, distribution, ecological relations, and chromosome number ($2n=22$) are briefly considered.

Physiologic specialization and genetics of the smut fungi, J. J. CHRISTENSEN and H. A. RODENHISER. (Minn. Expt. Sta. and U. S. D. A.). (Bot. Rev., 6 (1940), No. 8, pp. 389-435).—As used in the Ustilaginaceae the term physiological race is said to designate a collection of chlamydospores that behave more or less consistently in parasitism on certain differential varieties of host plants and not on others. The authors give a comprehensive, critical review of the literature (132 references) on this type of specialization as related to breeding for smut resistance and the selective effect of the host on pathogenicity, and as related to the genetics of this fungus group including details of the mechanism of heredity, the inheritance of specific characters, and mutations.

A Mendelian situation in the birthcoat of the New Zealand Romney lamb, F. W. DRY, P. R. McMAHON, and J. A. SUTHERLAND (Nature [London], 145 (1940), No. 3671, p. 390, fig. 1).—Lambs with an abundance of halo hairs appear from time to time in New Zealand Romney flocks. Breeding results indicate that the character is due to a single dominant factor linked with the sex-influenced factor for horns, with about 8-10 percent crossing over. Other data pointed toward the operation of two complementary factors for the halo condition. It is noted that halo lambs were produced by nonhalo parents.

Inheritance and linkage relations of mutant characters in the deer mouse, *Peromyscus maniculatus*, F. H. CLARK (Contrib. Lab. Genet., Univ. Mich., No. 7 (1938), pp. 11).—Following a description of 16 known alleles in the deer mouse, investigations of the linkage relations between pink eye and albinism, hairless and albinism, yellow and albinism, yellow and dilute, yellow and hairless, and yellow and buff are presented. All seemed to be in separate chromosomes except pink eye and albinism. Between these two genes there was 19.94 ± 1.44 percent crossing over in ♀ and 13.16 ± 2.70 percent crossing over in ♂ . The differences suggest that crossing over may be less frequent in ♂ than in ♀ . The data on the other genes did not indicate that linkages existed, and they were considered to be located in different chromosomes.

Umbrous: A case of dominance modification in mice, K. MATHER and S. B. NORTH (Jour. Genet., 40 (1940), Nos. 1-2, pp. 229-241, figs. 2).—The char-

acter umbrous consisted of a dark streak in the coat of agouti mice extending from the eyes to the tail. The character was a modifier of agouti not expressed in nonagouti animals. Breeding tests showed the original ♂ to be heterozygous *Uu*. Several different types of matings were made, and the types of progeny tabulated. Heterozygous agoutis were more affected by the *U* gene than the agouti homozygotes, and they were separable by the eye. The umbrous pattern was not so marked on *Uu* as on *UU* animals. Thus *U* is a dominance modifier. In a note, attention is called to Punnett's findings (E. S. R., 64, p. 530) that certain members of the *B* series in rabbits bring about various suppressions of the agouti character in homozygous and heterozygous animals resulting in the occurrence of refractory black. Attention is called to reasons why the two cases in rabbits and mice do not seem synonymous.

Inheritance of pinkeye in the fowl, D. C. WARREN. (Kans. Expt. Sta.). (*Jour. Hered.*, 31 (1940), No. 6, pp. 291, 292, fig. 1).—Three pink-eyed White Plymouth Rocks were found to produce only pink-eyed offspring. In a cross of 1 pink-eyed male mated with 3 normal-eyed heterozygous albinos, 46 chicks were produced, none of which was pink-eyed, suggesting that pink eye and albino were caused by different genes. Further results clearly demonstrated that pink eye is a recessive character which tends only to dilute the melanic pigment in the plumage pattern. Albinism and pink eye had similar effects on eye color, but the influence on plumage color was dissimilar.

Qualitative and quantitative differences in the morphology of spermatozoa from ring doves, Pearlnecks, and their F_1 and backcross hybrids, E. W. SHRIGLEY. (Wis. Expt. Sta.). (*Jour. Expt. Zool.*, 83 (1940), No. 3, pp. 457-479, figs. 3).—Morphologically, six classes of sperm were found in the F_1 and backcross hybrids between ringdoves and Pearlnecks. Each of the four groups of populations showed all six classes of sperm, with the proportions varying. A higher proportion of abnormal sperm was found in backcross individuals which possessed agglutinogens specific for the Pearlneck species and, therefore, some genes from this species (which were present in the F_1 s) than was found in the birds lacking these properties. No artificial method was found for producing anomalies of the sperm heads comparable to those observed, with the exception of one type involving an atypical staining reaction. It seemed that the spermatid nucleuses were unable to change from spherical to spearlike.

The isolation of oestrone from ox adrenals, D. BEALL (*Jour. Endocrinol.*, 2 (1940), No. 1, pp. 81-87).—The methods are described by which oestrone was isolated from two ox adrenal concentrates.

A comparison of the international gonadotropin standards, F. E. and M. C. D'AMOUR (*Endocrinology*, 27 (1940), No. 1, pp. 68-70, figs. 2).—Although the potency of the gonadotropin in pregnancy urine and pregnant-mare serum was comparable, pregnant-mare serum at higher levels proved more potent, especially in the ovarian response. A combination of the uterine weight-vaginal smear technic seemed most satisfactory for assaying preparations of unknown potency.

The rate of loss of activity of antigenadotrophic serum in vivo, M. R. A. CHANCE (*Jour. Endocrinol.*, 2 (1940), No. 1, pp. 99-103, figs. 2).—An antigenadotrophic serum of a goat immunized to human pregnancy urine lost 50 percent of its activity during the first day in vivo, with lesser losses in succeeding time intervals, as determined in tests with from 40- to 50-gm. rats.

The relation of diet to the restitution of the gonadotropic hormone content of the discharged rabbit pituitary, M. H. and G. S. FRIEDMAN (*Amer. Jour. Physiol.*, 128 (1940), No. 3, pp. 493-499, fig. 1).—The ability of does to restore the gonadotropic hormone to the pituitaries during the first 8 days of

pseudopregnancy following the complete discharge of the hormone at coitus was not related to diets containing from 0.007 to 2.56 percent of nitrogen. However, seasonal influences were pronounced and it was believed that protein requirements for gonadotropic hormone formation in the pituitaries can be fully met by nitrogen derived from the rabbit's own tissues.

The effect of heat on the gonadotropic pituitary antagonist. H. JENSEN, S. TOLKSDORF, and J. F. GRATTAN (*Amer. Jour. Physiol.*, 128 (1940), No. 3, pp. 532-536).—Comparative study in normal and hypophysectomized mature and immature ♀ rats of the effects of a boiling water bath for from 10 to 30 min. on the gonadotropic and antagonistic properties of sheep pituitary extracts containing follicle-stimulating and luteinizing hormones, administered with pregnant-mare serum, showed that heating destroyed the multiple physiological properties of the interstitial-cell-stimulating hormone, the luteinizing hormone, and antagonizing fractions at approximately the same rate.

Ovaries secrete male hormone.—V, A comparison of some synthetic androgens with the naturally occurring ovarian androgen in mice, R. T. HILL and M. T. STRONG (*Endocrinology*, 27 (1940), No. 1, pp. 79-82, figs. 5).—Continuing this series (E. S. R., 80, p. 608), comparison is reported of the weights of the prostates and seminal vesicles in castrate ♂ mice following injection at daily intervals and on alternate days of testosterone, testosterone propionate, androstenedione, and dehydrosterone. Ovarian ear grafts were also made for study of their effects on normal and castrate ♂s. The weights of the accessories determined at 5, 10, 15, and 20 days showed essentially the same stimulation from testosterone propionate plus Prognon-B as from ovarian grafts, indicating the physiological similarity of the androgen and of the ovarian principle although they were chemically different.

Mechanism of action of a progonadotrophic serum. I. W. ROWLANDS and P. C. WILLIAMS (*Jour. Endocrinol.*, 2 (1940), No. 1, pp. 75-80, fig. 1).—The globulin fraction of the serum of a goat injected with pig anterior-pituitary extract showed no progonadotrophic activity in hypophysectomized rats, although this effect was made evident in normal animals.

Species variation in thyrotrophic, gonadotrophic, and prolactin activities of the anterior hypophyseal tissue. M. R. A. CHANCE, I. W. ROWLANDS, and F. G. YOUNG (*Jour. Endocrinol.*, 1 (1939), No. 3, pp. 239-260, figs. 7).—Comparison was made by the guinea pig thyroid stimulation, pigeon crop-gland response, stimulation of ovarian weights in the rat, and initiation of ovulation in the rabbit by extracts of the pituitaries of man, horse, pig, sheep, and ox. Gonadotropically, the human pituitary tissue was much more active than tissue from any of the other species, but it had a small although not negligible content of prolactin and thyrotropin. The horse pituitary was second in its content of gonadotropin, when measured by the rat ovary test, with only small amounts of stimulation to the growth of the rabbit ovary. The pituitaries of the sheep and ox contained the most prolactin, with negligible amounts in tissues from pig and horse. Pig pituitary tissues were most active thyrotropically, whereas horse tissue was negligibly active when considered as a source of this active hormone. Considering different methods of preparation, alkaline aqueous alcohol was found to be greatly inferior to simple aqueous alkali for the extraction of the gonadotropic activity in horse pituitary tissue.

Uterine changes in the rabbit with the advent of pregnancy. M. GRAUBARD and G. PIVOUS (*Amer. Jour. Physiol.*, 128 (1940), No. 4, pp. 653-661).—Measurements were made of the content of ascorbic acid and other reducing substances in the ovaries, adrenals, and pituitaries of immature and mature rabbits in various stages of the oestrous cycle as a result of treatment with gonadotropic ma-

terial. Rabbits 3 days pregnant showed a definite increase in the ascorbic acid content of the uteri, but there was only a slight increase in the glutathione content. The adrenals and ovaries of pregnant animals showed similar increases. When injected with gonadotropic hormones, the pituitaries showed marked increases in ascorbic acid and glutathione. Increases in pregnant animals were noted up to 6 days of gestation. There was an increase of 75 percent in the respiration rate of the endometrium and whole muscle in 3-day pregnant rabbits.

Hypertrophy in the pseudopregnant uterus of the mouse following mechanical stimulation or treatment with vitamin E. I. SZABÓ (*Endocrinology*, 27 (1940), No. 1, pp. 125-128, figs. 2).—Oral administration of vitamin E to pseudopregnant mice resulted in uterine hypertrophy similar to that produced by mechanical stimulation of the cervix over a long period of time. Vitamin E did not cause uterine hypertrophy in the normal unstimulated mouse.

The influence of reproductive condition upon growth of the female rat. R. BOGART, G. SPERLING, L. L. BARNES, and S. A. ASDELL. (Cornell Univ.). (*Amer. Jour. Physiol.*, 128 (1940), No. 2, pp. 355-371, figs. 4).—The rate of growth was studied in 6 groups of 50 female rats each, which were subjected to the following conditions: (1) Bred at 9 mo. of age, (2) bred as early as they would breed, (3) bred at normal age (100 days), (4) never bred, (5) bred at normal age but not allowed to suckle young and rebred immediately after parturition, and (6) ovariectomized at about 40 days of age. Animals in groups 1, 2, and 3 nursed their young for 3 weeks and were then rebred. The ovariectomized rats grew more rapidly early in life than virgins or breeding animals. The virgins grew at a slower rate and reached a plateau in growth earlier than breeding animals, the growth period being approximately the same for the virgin and castrated animals. Animals breeding but not lactating grew more rapidly than the lactating animals or virgins and for a longer time than the latter. Breeding lactating animals grew more rapidly and for a longer time than virgins, also for a longer time than the castrated animals, but did not approach the growth rate of the castrated or breeding nonlactating animals. Early-bred animals were retarded in growth, due to lactation, but reached the same adult size as animals bred later. The late-bred females never attained the adult size of the other breeding animals but surpassed the virgins. Breeding stimulated growth even after animals had reached the growth plateau. It is suggested that oestrogens inhibit growth and that the corpus luteum removes this inhibition.

The reproductive efficiency of the albino rat under different breeding conditions. M. J. BARCOCK, R. BOGART, G. SPERLING, and S. A. ASDELL. ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 60 (1940), No. 12, pp. 847-853).—Four groups of 50 rats each were subjected to the following breeding regimes until they were 22 mo. of age: (1) Bred as early as they would breed, (2) bred at 100 days of age, (3) bred at 280 days of age, and (4) bred at 100 days of age but not allowed to suckle young and rebred as soon as possible after parturition. Animals in groups 1, 2, and 3 suckled their young for 3 weeks and then were promptly rebred. The average number of young produced per rat was 49.7, 54.3, 25.1, and 79.7 for groups 1 to 4, respectively. Average weights of young at birth and at weaning age were similar for all groups, with group 3 slightly exceeding the others. The over-all reproductive efficiency of the early-bred rats was somewhat less than that of the rats bred at normal age, while that of the late-bred rats was much lower than that of any of the other groups. Those rebred immediately after parturition produced many more young than did the groups subjected to lactation.

Postnatal masculinization of the female rat by means of testosterone propionate. H. SELYE (*Anat. Rec.*, 76 (1940), No. 2, pp. 145-155, pls. 2).—To

determine the importance of the age of the animal to its response to testosterone treatment, 11 newborn rats were intraperitoneally injected daily with 1 mg. of testosterone propionate for 15 days, and the dose raised to 3 mg. subcutaneously for 15 more days. On autopsy at 30 days of age, the ovaries in ♀♀ could not be detected, the uteri were very thin and atrophic, and the oviducts, although detectable, assumed a gelatinous translucent appearance. These effects in the young postnatal rat were in contrast to the production of uterine enlargement from testosterone treatment of older ♀♀. In ♂♂ the genital organs, especially seminal vesicles, prostate, and penis, were extremely well developed without decrease in testicular size. The adrenals showed marked atrophy.

Sexual development of fowls derived from eggs treated with oestradiol benzoate, J. H. GAARENSTROOM (*Jour. Endocrinol.*, 2 (1940), No. 1, pp. 47-54, pl. 1).—Chicks from 400 White Leghorn eggs injected on the second day of incubation with 300 µg. of oestradiol benzoate were autopsied 1 week, 2 mo., and 9 mo. after hatching to study the effects on the gonads. Intersex chicks were found to have right gonads from 25 to 66 percent of the size of the left gonads, and the presence of both ovarian and testicular tissue. Study of the gonads and secondary sex characters showed, in the birds killed 1 week after hatching, that there were 1 ♂, 33 ♀s, and 8 intersexes. This ratio gradually changed so that there were in the group killed at 2 mo. no ♂s, 19 ♀s, and 22 intersexes, and in the group killed at 9 mo. 17 ♂s, 10 ♀s and no intersexes. Histological study showed that the feminized ♂s could not maintain their ♀ sex organs during postnatal life. Control birds did not depart significantly from normal sex ratios.

Microhistometric assay of thyrotropic hormone in day-old chicks, R. W. RAWSON and W. T. SALTER (*Endocrinology*, 27 (1940), No. 1, pp. 155-157, fig. 1).—A very sensitive method for assaying thyrotropic hormone is described, based on daily injection for 5 days of newly hatched chicks. Autopsy and histological examination of the acinar cells were made on the sixth day. The increase in height of the cells served as the criterion of the thyrotropic potency of the material tested.

The endocrine control of lipid metabolism in the bird, I-III. (Univ. Calif. et al.). (*Jour. Biol. Chem.*, 126 (1938), Nos. 1, pp. 133-139, fig. 1; 2, pp. 763-769; 134 (1940), No. 2, pp. 493-504).—Three reports are noted.

I. The effects of pregnant mare serum upon the blood and liver lipids of the domestic fowl, C. Entenman, F. W. Lorenz, and I. L. Chaikoff (pp. 133-139).—In a study of factors involved in the lipid metabolism of chickens it was found that continued injections (8-27 days) of pregnant mare serum into immature female birds produced a rise in the blood lipides similar to that observed in normal laying birds (*E. S. R.*, 79, p. 674). The oviducts increased in size as a result of the injections, and a rise in blood lipides occurred when an oviduct growth of at least 10 gm. had been attained. Apparently the formation of yolks is not the stimulus for the rise in blood lipides, since no yolk growth was initiated in any of the experimental birds.

II. The effects of estrin on the blood lipids of the immature domestic fowl, F. W. Lorenz, I. L. Chaikoff, and C. Entenman (pp. 763-769).—Injections of an oestrogenic concentrate (prepared from pregnant mare urine) containing 25,000 rat units of oestrin per cubic centimeter into immature female birds raised the blood lipides. The effect occurred rapidly, an intramuscular injection of 3,000 rat units more than doubling the total lipid content of the blood within 12 hr. Injection of 2,000 rat units of the hormone into male birds caused a rise to over 1,000 mg. of total lipid per 100 cc. of whole blood. All lipid constituents were increased, but the most pronounced effect was upon the neutral fat.

III. *The effects of crystalline sex hormones on the blood lipids of the bird*, C. Entenman, F. W. Lorenz, and I. L. Chaikoff (pp. 495-504).—Compounds tested in these experiments included the oestrone, oestradiol, oestradiol benzoate, ethinyl oestradiol, and stilboestrol, all of which on intramuscular injections resulted in an increased concentration of total fatty acids, phospholipides, and cholesterol in the blood of chicks. Stilboestrol gave the most striking response. On the basis of rat units oestrone was more effective than oestradiol. Testosterone, progesterone, and desoxycorticosterone acetate had no influence on blood lipids, even when administered in excessive amounts.

FIELD CROPS

[Agronomic work in Alabama, 1938], H. R. ALBRECHT, E. L. MAYTON, H. B. TISDALE, J. B. DICK, E. V. SMITH, L. M. WARE, H. M. DARLING, and J. F. DUGGAR (*Alabama Sta. Rpt. 1938*, pp. 8, 9, 10, 17-21, 25, 26).—Research (E. S. R., 81, p. 33) reported on briefly dealt with development of *Crotalaria spectabilis* strains intermediate in maturity; time of turning winter legumes for cotton and corn; cotton varieties; seasonal activity of the bulbs of wild onion (*Allium vineale*) as related to its eradication from pastures and lawns by creosote-kerosene sprays; the life history of nutgrass (*Cyperus rotundus*) as related to possible methods of control; and yield differences in certified lots of seed potatoes.

[Field crops work in Arizona]. (Partly coop. U. S. D. A. et al.). (*Arizona Sta. Rpt. 1939*, pp. 39, 46-55, 60-63, 64, 81-88, figs. 6).—Reports of progress are made from experiments (E. S. R., 82, p. 174) at the station and substations,¹ including variety tests with grain sorghum, sorgo, alfalfa, soybeans, and green manure crops; comparison of corn varieties and hybrids; planting tests with grain sorghum varieties; breeding work with wheat (for smut resistance), grain sorghum, barley, alfalfa, and cotton; cotton experiments, concerned with irrigation needs, seed-delinting and germination of delinted seed of varieties at different temperatures, fertilizers, and date of seedling emergence in relation to growth characters; studies of factors, especially soil moisture and ratooning, influencing maturity and length of cotton fibers; cultural and fertilizer tests and a study of seed setting with alfalfa; measurement of winter growth of alfalfa progenies for grazing value; sugar beet seed production studies, including varieties and effects of planting dates, soil temperature, and nitrogen supply; cultural and harvesting tests with soybeans; range studies concerned with water requirements and fertilizer tests of range plants; relation of climatic conditions to vegetation; life history and reproduction of burroweed and its distribution on Arizona ranges in relation to soil conditions; and control of bindweed, horsenettle, nutgrass, and burroweed by different treatments.

[Field crops experiments by the Georgia Station]. (Partly coop. U. S. D. A., Ga. Coastal Plain and Fla. Expt. Stas., et al.). (*Georgia Sta. Rpt. 1940*, pp. 9-16, 20-38, 51, 52, 57, 58, 78-83, 85, 86, figs. 5).—Research with field crops (E. S. R., 82, p. 762) at the station and Mountain Substation and outlying fields, reported on briefly, comprised breeding work with wheat, oats, cotton, and peanuts; variety tests with corn, cotton, oats, soybeans, cowpeas, sorgo, and potatoes; relation of plant and fiber characters to yield of cotton; cotton nutrition research on ammonium v. nitrate nitrogen, need for trace elements, and T. V. A. phosphates; fertilizer experiments concerned with relationship between available nutrients in the soil and response of cotton and corn to potash and phosphate; effects of different combinations of phosphate and lime

on the yield of cotton; kinds of liming materials; effects of crop rotation on the organic matter in surface soils; sources of phosphate for cotton with ammonium sulfate as the nitrogen carrier; value of calcium sulfate (gypsum) in superphosphate for cotton; superphosphates for cotton with and without limestone; effects of lime as a supplement to fertilizer on corn; response of soybeans to phosphate and lime and to inoculation; effects of fertilization on yield of summer and winter legumes; green manure and harvesting tests with potatoes; variety, seeding, and fertilizer tests with fiber and seed flax, and determinations of oil content and iodine number of Georgia- and Minnesota-grown flaxseed; and pasture research, dealing with fertilizers and limestone for Bermuda-lespedeza pasture production, winter pasture clovers as a nitrogen source for summer grass, effects of lime and phosphate on pasture soils, influence of pastures and cultivation on soil organic matter, time and method of seeding Dallis grass, 1939-40 winter survival of introduced grasses, tests of selections of *Lespedeza sericea*, effects of fertilization on production and composition of pasture herbage, and adaptation of Ladino clover and tall oatgrass.

[Field crops and related agronomic problems in Kansas] (*Kans. State Hort. Soc. Bien. Rpt.*, 45 (1938-39), pp. 77-80, 121, 122, 125-143, 279-281).—Papers of agronomic interest in this report include Soil Reaction and Plant Growth, by R. I. Throckmorton (pp. 77-80) (*Kans. Expt. Sta.*); Sweet Potatoes—Making the Best Better, by H. Theden (pp. 121, 122); Recent Trends and Preferences in Marketing Sweet Potatoes, by A. E. Mercker (pp. 125-129), and The Sweet Potato Finds New Fields, by H. G. Knight (pp. 131-135) (both U. S. D. A.); Further Studies and Technic in Sweet-Potato Breeding in Louisiana, by J. C. Miller (pp. 137-143) (*La. Sta.*); and Summer Care of Lawns, by L. R. Quinlan (pp. 279-281) (*Kans. State Col.*).

[Farm crops work in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 3 (1940), No. 8, pp. 2, 6, 7, 8).—Progress results from experiments with field crops are reported in articles entitled Seeding Rates, Soybeans for Hay, by H. A. York; Placement of Superphosphate, Lime, Potash, Basic Slag in Relation to Planted Seed Influences Soybean, Austrian Pea, Vetch, by W. B. Andrews; Small Grain Variety Results Suggest Oats as Means of Increasing Feed for Livestock—State College and Substation Yields Given, by J. F. O'Kelly; and More Than a Bushel of Oats Secured From Each Pound Pure Nitrogen Applied in Tests Conducted at Stoneville Over 13-Year Period, by R. Kuykendall.

[Agronomic research in Rhode Island]. (Partly coop. U. S. D. A. and Mass. and Conn. Expt. Stas.). (*Rhode Island Sta. Rpt.* [1939], pp. 8-16, 20-22, 23, 24, 34-37).—Reports of progress are made from variety tests with corn, potatoes, and lawn and turf grasses; fertilizer experiments with potatoes, mangels, rutabagas, onions, cabbage, mixed hay, and lawn and turf grasses, particularly varieties and strains of bents; boron studies; planting and pH range tests with potatoes; residual effects from different levels of fertilizer, as shown by yields of mixed hay; effects of crops on succeeding crops, involving soil treatment with chloropicrin; crop rotations; root development of pasture grasses, and their responses to different lengths of day and levels of soil moisture; breeding work with bentgrasses and alfalfa; control of lawn weeds; seed production of bentgrass varieties and strains, especially in response to cultural and fertilizer treatments; and comparisons of Sudan grass, millet, oats, and winter rye and wheat for supplementary pasture.

Factorial design in plant nutrition experiments in the greenhouse, C. H. WADLEIGH and W. H. THARP. (Coop. U. S. D. A.). (*Arkansas Sta. Bul.* 401 (1940), pp. 66).—Designs and analyses of four factorial cotton plant nutrition experiments carried out in the greenhouse are presented, with comments on

weaknesses in certain designs and on circumstances under certain greenhouse manipulations that tend to obviate the apparent inferiorities of the unorthodox arrangements. Satisfactory procedure for the analysis of variance is presented in each case with the inclusion of a few possible modifications.

Experiment A is a $3 \times 3 \times 2 \times 2$ design with four replicates comprising four blocks. Main effects were confounded with split-plots, and the procedure was presented for correctly taking into account such a contingency and for segregating the components of a two-degree-of-freedom factor into its individual components. A method applicable for studying plant disease data of the type presented on a proportionate basis was suggested. Experiment B presents a $3 \times 3 \times 2 \times 2$ design with time of observation considered as one of the factors. The two degrees of freedom of each three-level factor were partitioned into individual degrees of freedom. The method of analyzing the data, according to single degrees of freedom with individual error terms, is presented. Comparison of results obtained by using individual error terms, the fully pooled error, and grouped errors provides a basis for discussing the relative merits of various methods of treatment of error.

Experiment C illustrates a $2 \times 2 \times 2 \times 2$ arrangement. It demonstrates the simplicity of the analysis by the tabular method possible in a 2^n design. The advisability of confounding a higher order interaction with subblocks, together with the procedure involved, is illustrated. Experiment D demonstrates the technic of confounding a $3 \times 2 \times 2 \times 2$ experiment, together with its analysis by the tabular method. The presence of a three-level factor appreciably complicates the procedure, but the method has been found to be satisfactory.

The effect of liming on the absorption of phosphorus and nitrogen by winter legumes, F. L. DAVIS and C. A. BREWER, JR. (La. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 6, pp. 419-425, figs. 2).—Austrian Winter peas and common vetch were grown with various fertilizer treatments at several locations on upland soils in Louisiana. Liming soils low in calcium content enabled the crops to utilize more of the phosphorus supplied by superphosphate. Lime alone produced an increase in percentage content of calcium only, while lime applied with superphosphate resulted in increased contents of calcium, phosphorus, and nitrogen. Review of earlier data on the relationship between readily available soil phosphorus and crop yields (E. S. R., 68, p. 740; 75, p. 165) further showed that those soils, on which the yield of sorghum was unexplainably low in relation to the available phosphorus, were also low in exchangeable calcium. It is thought that a low calcium content of soils may explain lack of agreement between crop yields and rapid tests for phosphorus on many southern soils.

A division of the alfalfa cross-inoculation group correlating efficiency in nitrogen fixation with source of *Rhizobium meliloti*, J. C. BURTON and L. W. EEDMAN (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 6, pp. 439-450, figs. 11).—In nitrogen-fixation studies of strains of *R. meliloti*, the organism isolated from alfalfa and sweetclover failed to cause any significant fixation on bur-clover or fenugreek. Strains of the bacteria isolated from bur-clover or fenugreek showed an average percentage effective on all four hosts. It was concluded that the bacteria living in association with alfalfa and sweetclover lose some component not needed for high nitrogen fixation on these legumes but which is very necessary for fixation with bur-clover and fenugreek. The nodule-forming capacity of the legume bacteria evidently is not altered by association with any of the four legumes.

The uses of alfalfa, H. L. WESTOVER and W. H. HOSTERMAN (*U. S. Dept. Agr., Farmers' Bul.* 1839 (1940), pp. [2]+36, figs. 16).—Dealing mainly with the

making and feeding of alfalfa hay; alfalfa hay standards; pasturing alfalfa; using the crop for silage, soiling, green manure, and as a cover crop; preparing and feeding ground alfalfa; alfalfa mixed feeds; and dehydrated alfalfa, this publication is a revision of and supersedes Farmers' Bulletin 1229 (E. S. R., 46, p. 531).

The establishment of Bahia grass, *Paspalum notatum*, G. W. BURTON. (U. S. D. A. and Ga. Coastal Plain and Ga. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 7, pp. 545-549, fig. 1).—Planting tests with two strains of Bahia grass, untreated and scarified with sulfuric acid (E. S. R., 81, p. 373), demonstrated that, regardless of the way in which the seed is planted, acid scarification will greatly increase the number of plants obtained per pound of seed. With the current high prices of seed, drilling seed from $\frac{1}{4}$ to 1 in. deep in well-prepared seedbeds, if possible, or covering seed with disk harrows in areas where good seedbeds cannot be made should be profitable. For seed production or as a less costly practice, drilling from 4 to 6 lb. of good scarified seed in rows 2 ft. apart followed by several cultivations is considered a very economical method. Emergence tests in a well-prepared Tifton sandy loam indicated that good Bahia grass seed, properly scarified, will germinate at least as soon as other grasses, such as carpet and Dallis grass, now being planted in the area.

A comparison of nitrogen carriers for bent grass fertilization, J. A. DEFRANCE and T. E. ODLAND. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1084-1090).—In a 6-yr. comparison, Colonial, creeping, and velvet bents received different nitrogen carriers, together with enough superphosphate and potassium chloride to make a 10-6-4 complete fertilizer. The standard 10-6-4 fertilizer carrying a mixture of organic nitrogen as activated sludge (3) and of ammonium sulfate (5) and sodium nitrate (2) was found most suitable and very satisfactory on a comparative cost basis. Inorganic nitrogen applied alone did not produce a uniform turf throughout the season. A 1:1 mixture of ammonium sulfate and activated sludge produced nearly as good a response as the standard, but cost 16 percent more per pound. Ammonium sulfate had a quick but not lasting effect. Clover was least on the ammonium sulfate plats and the ammonium sulfate-sludge mixture and the most on activated sludge and cottonseed meal plats. The organic sources seemed to stimulate more clover. Invasion of bent mixture into Rhode Island Colonial and Washington creeping bent was greatest on the activated sludge plats, and, in general, more was found on organic plats than on inorganic. No grasses invaded any of the plats of Piper velvet, probably because of its fine texture and density. The different fertilizers had very little effect on resistance to the brown patch and dollar spot diseases.

The growth habits and chemical composition of bromegrass, *Bromus inermis* Leyss, as affected by different environmental conditions, J. M. WATKINS. (U. S. D. A. and Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 7, pp. 527-538).—Fertilization of bromegrass with nitrogen (ammonium sulfate at the rate of 150 lb. per acre applied in September, March, and July) increased the rate of leaf production, height and total number of shoots, number of fertile shoots, and dry weight of tops, but decreased number of rhizomes and weight of the underground parts. Shade, provided by bleached sheeting over wooden frames, decreased numbers of shoots, rhizomes, and of fertile shoots, and dry weight of all plant parts, and increased number of elongated internodes and plant height. Internodes were more uniform in length than those on shoots from other plats. Associated growth of alfalfa with bromegrass decreased numbers of shoots and of rhizomes and dry weight of the brome-

grass plants. Plants fertilized with nitrogen and check plants at bloom stage were low in percentage of nitrogen and high in percentage of carbohydrates, although the absolute amounts of both were highest in the nitrogen-fertilized plants. Shaded plants were high in percentage of nitrogen and low in carbohydrates as compared to checks.

Brome grass plants grown under short days (8.5 hr.) produced a rosette type of growth, and the shoots developed in a decumbent position. Plants grown under normal days (15 hr.) and long days (18 hr.) developed in an upright position, the latter attaining the greater height. While the total number of shoots per plant was greatest under short days and least under long days, normal-day plants produced more fertile shoots. The maximum number of rhizomes was produced under normal day length in late spring or summer, but they attained greatest size and length under the long days. Dry weight of plant parts rose as the number of light hours per day was increased. Both percentage and absolute amounts of carbohydrates were highest in long-day plants. Short-day plants contained the highest percentage of nitrogen, yet the absolute amounts were about the same under each length of day.

The testing of buffalo grass "seed", *Buchloe dactyloides* Engelm., M. M. PLADECK. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 7, pp. 486-494).—The establishment of a good stand of buffalo grass from seed appeared to be influenced strongly by the character of the seed material. A poor seed set indicates a low percentage of burs which contain caryopses. Difficulty in harvesting material from the ground results in a low percentage of burs in the harvested material. Harvesting before burs are mature and have been weathered results in a low germination when planted.

Burs at least partially weathered in appearance were made to germinate in the laboratory to within 10 percent of the seed set or caryopsis count, either without treatment or by soaking or chilling. Burs immature and greenish, or mature but not weathered, gave increased germination after prolonged chilling or after warm stratification followed by cold treatment. Proof was obtained that the profound dormancy of this seed cannot be overcome appreciably without prolonged chilling at least for longer than a month. Harvesting burs after a period of natural weathering is, therefore, recommended. Optimum germination tests were made in sterilized soil in petri dishes at a daily temperature alternation of 20°-30°, or 20°-35° C., with light, and required from 6 to 8 weeks. No germination occurred at or below 10° (50° F.). Dormant grains were made to germinate by puncturing the pericarp. Most of the burs examined contained one or two caryopses per bur, and a few contained three or four, and likewise in germination tests the majority of burs germinating produced one or two seedlings and a small percentage three or four. Germination of healthy grains was changed in no way by the presence of diseased grains in the same bur. The presence on occasional plants and also in most seed samples of nematode galls suggested a disease widespread in Texas and of possible economic importance.

Effect of treating different horizons of Sassafras loam on root development of red clover, N. A. FERRANT, JR., and H. B. SPRAGUE. (N. J. Expt. Stas.). (*Soil Sci.*, 50 (1940), No. 2, pp. 141-161, figs. 8).—The root system of red clover grown in Sassafras loam with several cultural and fertilizer treatments was studied to determine the limiting factor or factors of root development in New Jersey. For all red clover plants examined, the root systems were less extensive than those reported in Western and Midwestern States. Soil acidity, texture, pore space, and nutrient supply apparently had little influence on root penetration. The deepest penetration and occupation of the B horizon by roots occurred in plats tilled in A₂ horizon without other treatment. Plats

receiving combinations of lime, manure, and fertilizer had an extensive root development in the A₁ horizon, a much more limited one in the A₂ horizon, and almost none in the B horizon. Indications were that some factor or factors in the A₂ horizon of certain New Jersey soils is corrected by tilling, and that this permits roots of red clover to pass through this horizon and develop extensively in the B horizon. See an earlier note by FARRIS (E. S. R., 72, p. 36).

Varietal and cultural experiments with corn, C. K. MCLELLAND (*Arkansas Sta. Bul.* 402 (1940), pp. 31).—Varietal experiments with corn (E. S. R., 57, p. 629) showed leading varieties at the station, 1927-38, to include Pride of Saline, Paymaster, Mexican June, Commercial White, Thatcher Golden Dent, Southern Beauty, White Wonder, and Surcropper; on upland at the Cotton Substation (1927-38) Paymaster, Delta Prolific, Hastings Prolific, Cocke Prolific, Jarvis Golden Prolific, White Wonder, Thatcher Golden Dent, and Whatley Prolific; on delta land at the Cotton Substation (1931-38) Mexican June, Surcropper, Delta Prolific, Southern Beauty, Ewing Mosby, Pride of Saline, and Thatcher Golden Dent; at the Fruit and Truck Substation (1927-38) Surcropper, Ferguson Yellow Dent, Pride of Saline, Mexican June, Delta Prolific, and Thatcher Golden Dent; and at Scott experimental field (1927-31) Surcropper, Delta Prolific, Ewing Mosby, Pride of Saline, Cocke Prolific, Mexican June, Whatley Prolific, and Ferguson Yellow Dent. In northwestern Arkansas, Paymaster and the western varieties were superior, in southwestern Arkansas the western corns, and in eastern and central Arkansas prolifics were in the lead. Paymaster, Pride of Saline, Delta Prolific, Surcropper, Mexican June, and Thatcher Golden Dent proved dependable in all parts of the State.

Planting tests suggested from April 15 to May 15 at the station, within the range from April 15 to June 1 at the Cotton Substation, and from May 15 to June 15 at Scott. To avoid heavy corn crop losses from adverse weather, part of the crop may be planted early and the remainder at a later date. In cultivation experiments significant reductions in yield at the station followed no cultivation, delay for 8 weeks after planting, and laying by when only 2 ft. high. At Scott similar results were obtained for the 8-week delay and no-cultivation methods; and also significant reductions resulted from very shallow cultivation and 6-week delay of cultivation. Evidently, one reasonable method of cultivating and keeping down weeds is as good as another, but delay in starting cultivation, terminating the work too quickly, or utter neglect of the crop will cause decreased yields.

Seed growers aid in evaluating new corn hybrids. G. H. STRINGFIELD. (Coop. U. S. D. A.). (*Ohio Sta. Bmo. Bul.* 205 (1940), pp. 131, 132).—Comment is made on the increasing number of commercial corn hybrids being sold in Ohio and on new hybrids under cooperative (E. S. R., 82, p. 765) development and evaluation. The estimated corn acreage planted to hybrids in Ohio has expanded from 1,100 (0.03 percent) in 1933 to 66,330 (1.80 percent) in 1936 and to 1,952,000 acres (57 percent) in 1939.

Economic aspects of one-variety cotton communities in Tennessee, C. E. ALLRED and B. D. RASKOFF (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog.* 111 (1940), pp. III+37, figs. 11).—A study of the character of the cotton produced and marketed and the marketing practices in two outstanding one-variety cotton communities in Tennessee, the Eaton Central Cotton Improvement Association in Gibson County and the Cerro Gordo One-Variety Community in Hardin County, is reported, with a brief review of the development of one-variety communities in the United States and Tennessee. Suggestions are made for the improvement of the enterprise which has grown in Tennessee since 1931 until in 1939 there were 125 such communities in the State, with an estimated acreage of 200,000.

Of the 718 bales of cotton produced by the Baton-Central community (I) in 1939, 82 percent graded white middling and better and 77 percent stapled 1 in. and longer. In the Cerro Gordo community (II) with 150 bales, 80 percent was middling or better and 53 percent stapled 1 in. and longer. Where the seed was 4 yr. away from the breeder the average staple length decreased 0.4 of $\frac{1}{32}$ in. in community I and 1.5 of $\frac{1}{32}$ in. in community II. Cotton grown from seed longer than 4 yr. away from the breeder decreased 1.04 percent in lint turn-out in community I and 2.73 percent in community II. In community I, 29 percent of the bales weighed less than 450 lb. and 14 percent weighed over 550 lb., and in community II the percentages were 11 and 18, respectively. A need was shown for farmers to adjust size of loads brought to the gin to secure the more uniform bale weights desired by spinners. Ginning was 97 percent completed by November 14 in community I and 82 percent in community II. With the development of one-variety communities and early-maturing varieties in recent years, there has been a general increase in the percentage of cotton ginned to November 14. Of the cotton grown by community I, about 87 percent was purchased by the ginner on the same day ginned. The ginner resold over half the cotton purchased in from 1 to 5 days, and none was held longer than 15 days. The ginner paid prices to growers generally in line with the central market at Memphis.

Influence of mass selection within certain large-seeded Virginia-type peanut varieties, C. E. STEINBAUER, J. H. BEATTIE, and E. T. BATTEN. (U. S. D. A. and Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.* 36 (1939), pp. 685-688).—Further single-plant selections were made from strains of large-seeded Virginia-type peanuts (E. S. R., 70, p. 40). Initial selections were made in 1933 by weighing the crops produced by each of from 200 to 300 consecutive plants from each of 8 strains and placing in 1 lot for each strain nuts from hills yielding 100 gm. or over, a second lot nuts from hills making less than 100 gm., and a third (standard) seed from a random lot of hills not separated as to yield. From 1934 to 1937, inclusive, single 75-ft. rows of each of the 3 lots of each strain were planted every year under comparable conditions, and seed for the succeeding season was selected on an 80-gm. basis for high, low, and standard lots from the respective plantings. No deviations large enough to be detected by mass selection of seed stock over 4 yr. developed in any of the 8 strains since the original single-plant selections were made. Their behavior appeared to confirm the assumption that the strains are essentially pure lines. Variations between plats grown from mass-selected and unselected seed stock apparently were due to external factors and not transmissible or cumulative.

Peanut production, H. O. WEST (*Mississippi Sta. Bul.* 341 (1940), pp. 63, figs. 19).—Information compiled largely from reports of experiments by State experiment stations covers farm organization, soils and climate, land preparation, varieties, selection and preparation of seed, planting, fertilizers, cultivation, digging, stacking, picking, use of vines for hay, digging and hogging, labor requirements, marketing, insect pests and diseases, and peanuts for pork production.

The importance of border effect in certain kinds of field experiments with potatoes, W. C. JACOB. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 866-870).—The extent of border effect was studied in an experiment at Riverhead, N. Y., in which 4-ft., cropped, unfertilized aisles were maintained around every treatment plat and in another experiment in which the treatments bordered each other without buffer aisles. The border effects followed closely the actual differences between adjoining treatments. Even where treatments were separated by aisles, the effect of adjoining treatment

plats could be discerned in the first border row. Although manure treatments were largely broadcast, the border influence was practically the same as on plats in which fertilizers were applied in the row. Border effect was concluded to be an important factor in yield of outside rows of fertilizer experiments. Use of untreated aisles around treatment plats does not reduce and may increase the edge effect, since the difference between nil and any other treatment may be greater than between any two fertilizer treatments. In experiments having small differences between treatments and in which there are no aisles between plats, the discarding of one outside row from each edge of the plat will eliminate most of the border effect.

Seed preparation and cultural treatments in relation to stand of plants in fall crop potatoes in Oklahoma, H. B. CORDNER. (Okla. A. and M. Col.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 879-883, figs. 2).—Cut sets of Triumph potatoes consistently produced better stands than whole tubers in fall plantings with high soil temperatures. Early sprouting of the seed favored the possibility of establishment of a plant before the seed piece entirely disintegrated. There was some evidence that presence of sprouts on the set might delay disintegration. Delayed sprouting due to lack of soil moisture resulted in low stands. Indications were that presprouting, accomplished by placing ethylene chlorohydrin-treated tubers in moist excelsior, was more advantageous in the earlier (unirrigated) planting and especially in relation to whole seed. With irrigation, sprout emergence was unusually early for all seed types, and no marked difference was found between sprouted and unsprouted seed.

The rate of respiration in potato tubers at high temperatures in relation to treatment with ethylene chlorohydrin, N. M. WARD. (Okla. A. and M. Col.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 871-873, fig. 1).—Agreeing with findings of Kimbrough (E. S. R., 53, p. 636) and Appleman and Smith (E. S. R., 76, p. 627) on the influence of temperature changes in regard to respiration rate, the results reported show that the same response may be secured over a higher temperature range (from 70° to 95° F.). When treated tubers are placed at from 90° to 95°, their maximum capacity for respiration apparently is attained and continues until they undergo a complete physiological breakdown. Contrariwise, treated tubers at 70° have a high initial rate of respiration which declines rapidly and after 5 days does not greatly exceed that for untreated potatoes at the same temperature. After the stimulus of the chemical treatment is worn off, tubers respond to temperature rises similarly to untreated tubers. Tubers treated at from 70° to 80° and allowed to aerate at that temperature long enough to allow the rate of respiration to approximate that of untreated tubers may then be planted at a soil temperature of 90° with less danger of break-down due to the high rate of respiration.

Rice variety experiments in Arkansas, M. NELSON and C. R. ADAMS. (Coop. U. S. D. A.). (*Arkansas Sta. Bul.* 403 (1940), pp. 28).—Outstanding varieties (E. S. R., 65, p. 732) in field plat experiments (1931-39) at the Rice Substation were short-grain, Caloro 55.1 bu. per acre and Acadia 54.3 bu.; medium-grain, Zenith 50.7 bu. (recommended to replace Early Prolific 49.3 bu.) and Supreme Blue Rose 44.5 bu.; and long-grain, Arkansas Fortuna 52.4, Lady Wright 44.8, and Nira 43.3 bu. It seems advisable for a farmer to grow more than one variety of rice. Combinations of varieties suggested from the results are Zenith, and Nira or Supreme Blue Rose, with (1) Caloro or Acadia, or (2) Arkansas Fortuna. The nursery experiment with introductions and selections indicated that Nakata Shinriki, an early short-grain variety, might be grown to advantage in Arkansas.

Results of hybridization work indicate that medium- and long-grain varieties may be developed that may surpass the principal varieties now grown in the

State. A medium-grain selection either from Kameji \times Blue Rose or Caloro \times Blue Rose may eventually replace part of the Blue Rose acreage. An early long-grain selection from either Improved Blue Rose \times Fortuna or Edith \times Fortuna may sometime replace part of the acreage growing Edith, Lady Wright, and Nira.

I, Factors in soybean production; II, Variety recommendations and characteristics, R. L. LOVVORN (*North Carolina Sta. Agron. Inform. Cir. 126* (1940), pp. [1] + 6).—A revision of Agronomy Information Circular 102 (E. S. R., 77, p. 330).

Hybrid vigor in sugar beets, D. STEWART, C. A. LAVIS, and G. H. COONS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 60 (1940), No. 11, pp. 715-738, figs. 7).—Field tests at Fort Collins, Colo., in which sugar beet hybrids arising as single crosses of inbred strains or as top crosses of inbred strains on an open-pollinated variety were compared with the parental sorts and the commercial brand Pioneer, are reported. Certain strains used as parents, the product of many generations of inbreeding, showed divergence in root yield, sucrose percentage, and disease resistance. Several of the strains were relatively productive even after a number of generations of inbreeding. More than two-thirds of the hybrid progenies obtained showed significant increase in root weight attributable to hybrid vigor. The average root weight of the 41 hybrids was found to be 38.9 percent greater than that of the Pioneer brand used as control. In crosses involving strains unlike in richness of sucrose, the percentage in the hybrid tended to approach the average of the parents. Certain crosses indicated that heterozygous varieties may be improved in specific characters by top crossing with inbred strains which can contribute some desired character. A tendency toward self-fertility with continued inbreeding might interfere with a high degree of intercrossing between strains when utilization of the F_1 generation is attempted in commercial seed production. U. S. 217, a synthetic sugar beet variety, produced by intercrossing five of the strains found to show heterosis response and also resistance to *Cercospora* leaf spot, represents an attempt to obtain an improved variety by purposeful crossing of inbred strains.

Relation of fertilization to the yield and keeping quality of sweet potatoes, N. D. MORGAN. (Iowa Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 849-854).—Sweetpotatoes grown on Buckner coarse sand responded to complete fertilizers in highly significant yield increases. Not more than 2 percent nitrogen was needed under the conditions, and on a fairly fertile soil with a legume in the rotation, nitrogen probably could be omitted. Superphosphate up to 10 percent was needed, and with heavy rainfall or proper irrigation higher percentages might give increased yields. Potash, a most important fertilizer constituent, gave significant and profitable yield increases up to 12 percent. Further increase in potash up to 18 percent gave additional although smaller yield increases. Sweetpotatoes grown with complete fertilizer containing a good proportion of potash kept better in storage than those grown without fertilizer. Sweetpotatoes from the 3-10-0 and no-fertilizer plots contained a slightly higher percentage of sugar than those from other treatments, although variations in the percentages of nitrogen, phosphorus, and potash in complete fertilizer did not seem to influence sugar content.

Starch in freshly dug sweet potatoes estimated from the moisture content, W. D. KIMBROUGH. (La. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 846-848).—Studies over several years in connection with sweetpotato breeding research revealed a high negative correlation between the moisture and carbohydrate contents of sweetpotatoes. High moisture content has meant relatively low carbohydrate content, and the sums of the two

percentages have been fairly constant. The sugar content of freshly dug sweet-potatoes of a given variety not left in the ground for longer than a day or so after vines have been removed or frost-killed has been practically constant. Tabulated results of determinations on the Triumph, Wennop, and Porto Blanco varieties planted and dug at various dates gave a wider range in potato maturity than normally found in those dug for starch production, yet the sums of moisture and starch percentages were fairly constant.

Spring wheat varieties in South Dakota, S. P. SWENSON. (Partly coop. U. S. D. A. et al.). (*South Dakota Sta. Bul. 342* (1940), pp. 55, figs. 8).—Results of varietal experiments with common and durum spring wheats at the station and substations and cooperative with farmers are reported for 1930-39, supplementing previous reports (E. S. R., 66, p. 825; 73, p. 170). Data are also included on the wheat acreage and producing districts and the relative importance of common spring and durum wheats in South Dakota, and on results of milling and baking tests on a number of the varieties. Brief descriptions of varieties tested are appended.

The average annual acreage of 2,207,000 acres of wheat harvested in South Dakota, 1936-38, included 1,587,000 acres of common spring wheat and 508,000 acres of durum. Ceres and Thatcher, the most important hard red spring wheats in the State, were sown on 33.5 and 24.5 percent, respectively, of the total wheat acreage. Pentad (Red durum) with 8.6 percent and Mindum with 1.1 percent occupied the largest percentages of the acreage among named durum varieties.

Thatcher is the outstanding hard red spring wheat in eastern South Dakota where rust may be a serious hazard. Both Thatcher and Ceres may be grown in a transitional area farther west. Ceres is recommended in the western half of South Dakota or wherever grasshoppers, heat, and drought are more serious than black stem rust. Reward may be grown as an early-maturing variety in central and western portions of the northern, central, and southern hard red spring areas where stem rust epidemics are not likely. However, Reward is much more susceptible than Ceres or Thatcher to grasshopper attacks. Pilot, Rival, Renown, and Nordhaugen had not been grown long enough for definite recommendations. Mindum is the leading durum, although Arnautka and Kubanka also may be grown to advantage in districts indicated for Reward. A shift from durum to hard red spring wheat seemed desirable in areas where black stem rust had limited hard red spring wheat production and encouraged the growing of durum.

Quality studies on North Dakota durum wheats (1938 crop), R. H. HARRIS and D. KNOWLES. (N. Dak. Expt. Sta.). (*Cereal Chem.*, 17 (1940), No. 4, pp. 480-490, fig. 1).—Durum wheats grown at the station were higher in semolina yield than those grown at Langdon, attributable to differences in test weights. The Langdon durums, however, were higher in protein content and produced macaroni of better and more acceptable color and scored higher in tenderness than station samples. No relationship was noted between color and cooking quality in this series. The determination of cooked weight, more rapid and precise, is deemed preferable to the determination of cooked volume. A negative relationship was evident between cooked weight and protein.

A biochemical and technological study of Punjab wheat varieties, R. SINGH and C. H. BAILEY. (Minn. Expt. Sta.). (*Cereal Chem.*, 17 (1940), No. 2, pp. 169-203, figs. 5).—A biochemical and technological study of a number of Punjab wheat varieties grown by the Punjab Agricultural Research Institute, Lwailpur, India, 1935-36, is reported. Eight of the 31 samples used included 8A, 9D, C518, and C591, improved wheat types extensively grown by farmers in Punjab.

Of a total acreage of from 9 to 10 million acres annually cropped to wheat, these 4 types occupied as much as 50 percent, and 8A alone occupied 3,161,700 acres. The other 23 samples were recent hybrids still in the experimental stage. The status of the wheat crop in the Punjab and its improvement are described briefly.

Averages from the data were for 1,000-kernel weight 41.4 gm., weight per bushel 63.9 lb., moisture content 10.8–11.8 percent, flour yield 73.9 percent, crude protein 10.36 percent, diastatic activity 221–291, water absorption of flour 72.6 percent, loaf volume 502 cc., and carotenoid pigment of flour 2.50–1.42 p. p. m. Correlations were between bushel weight and flour yield $r=0.219$, crude protein in wheat and percentage of mottled grains in each sample -0.66 ± 0.06775 , and between water absorption of flour and protein content $+0.6747 \pm 0.066$. Under one set of conditions noted among these wheats the maximum viscosity occurred at pH 4.5, while in the other type it occurred at pH 2.8 to 3.0. Farinograms showed that the dough development times of these flours usually were short, and the range of dough stability was also comparatively narrow.

The breeding significance of after-harvest sprouting in wheat, J. B. HARRINGTON and P. F. KNOWLES (*Sci. Agr.*, 20 (1940), No. 7, pp. 402–413).—Moist weather resulted in the germination of ripe wheat standing in field nurseries at the University of Saskatchewan, in September 1938 and a study was made of the comparative sprouting behavior (*E. S. R.*, 68, p. 189) of 17 varieties and 157 purified hybrid lines from 4 crosses. The percentage sprouting of standard varieties ranged widely, averaging for Apex (Sask. 1789) 3.9, Thatcher 6.5, Renown 8.4, Marquis 11, Reward 34, Reliance 47.8, Ceres 57.9, and Garnet 78.8. The 3 varieties with highest resistance to sprouting are also stem rust resistant. Among hybrid lines of some crosses the parental range for sprouting was exceeded by 1 or more lines showing lower percentages of sprouting than the better parent. Results on sprouting from material which matured 3 and 6 weeks, respectively, before the rains agreed well with results obtained in dormancy studies on the same varieties.

The effect of ethylene on freshly harvested wheat, A. K. BALLS and W. S. HALE. (U. S. D. A.). (*Cereal Chem.*, 17 (1940), No. 4, pp. 490–494, fig. 1).—Small doses of ethylene (1/1,000 and 1/10,000) could mature freshly harvested combine wheat very quickly in the sense that it becomes suitable for bread making. An immediate increase in viability of the treated wheat was observed with a low concentration, but there was evidence that more ethylene is decidedly harmful.

Germination of seed of vine-mesquite, *Panicum obtusum*, and plains bristle-grass, *Setaria macrostachya*, V. K. TOOLE (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 7, pp. 503–513).—The alternating temperatures, room temperature to 35° C., or from 20° to 35°, were better for germination of seed of *P. obtusum* than other alternating or constant temperatures tested. Pretreatment with approximately 71 percent sulfuric acid for 90 min. overcame resistance of the seed to germination. There was no consistent improvement of germination with age, but the rate was increased by acid treatment regardless of age of seed. Seed of *S. macrostachya* germinated best at alternating temperature of from 10° to 35° or from 35° to 10°. The seed was benefited by prechilling or by pretreating with the sulfuric acid for from 15 to 30 min. Potassium nitrate solution improved germination of both species.

Three new weeds introduced into Utah, B. MAGUIRE (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 3, p. 3, figs. 3).—Bermuda grass, nutgrass, and leafy spurge, recently introduced potentially serious weed pests, are described and illustrated, with recommended control measures.

The rate and mode of penetration of herbicides.—I, Copper nitrate solutions, W. H. SILVERSIDES (*Sci. Agr.*, 20 (1940), No. 7, pp. 419–423, pl. 1).—

Dandelion leaves were collected at intervals from plants in the bluegrass lawn at the University of Manitoba sprayed with a 2-percent copper nitrate solution at the rate of 200 gal. per acre. Photomicrographs showed the gradual infiltration of the spray into the leaves. The epidermal cells generally were less damaged than those of the parenchyma, and in the treated areas of the leaf chloroplasts could not be distinguished and the damaged tissue tended to take on heavy staining. It appeared that the spray penetrated the epidermis chiefly. Complete penetration by the spray into the leaf was noticed first in the leaves collected 30 min. after treatment.

HORTICULTURE

[Horticultural studies by the Alabama Station], K. C. BARROWS and E. W. McELWEE (*Alabama Sta. Rpt. 1938, pp. 22-25*).—Included are reports on variety tests with pole beans and a comparison of ground peanut hulls and other organic materials for use in greenhouse soils.

[Horticultural studies by the Arizona Station]. (Partly coop. U. S. D. A. et al.). (*Arizona Sta. Rpt. 1939, pp. 66-75*).—Reports of progress are presented on the fertilization of lettuce; breeding and improvement of lettuce and cantaloups; storage requirements of lettuce seed; cultural needs of vegetables on the Yuma mesa; chemical and physical indexes of maturity in grapefruit; protection of Salt River Valley citrus groves from low-temperature injury; fertilization of citrus; factors affecting the quality and yield of grapefruit; N assimilation by citrus trees; storage requirements for grapefruit; factors influencing the maturity and storage of dates; factors affecting the yield of pecan varieties and the filling of pecan nuts; factors, such as shuck opening, that may be used as indicators of maturity in pecans; testing of rootstocks for the peach, fig, and grape; and the testing of cassava.

[Horticultural studies by the Georgia Station] (*Georgia Sta. Rpt. 1940, pp. 66-73, 83-85, 86-88, figs. 3*).—Included are reports on tomato variety trials, the detrimental effect of roasting and scalding pimiento pepper fruits on the planting value of the seed, fertilizers for pimiento peppers, influence of date of planting on yield of the pimiento pepper, breeding of squash and collards, testing of peach varieties, growth of peach roots, the use of hormones in the rooting of muscadine grapes and other plants, and cold injury to muscadine grapes.

Work reported from the Mountain Substation includes the effect of low-temperature injury on various fruits and on the lespedeza cover crop, the value of turning under crimson clover for vegetables, testing of tomato varieties, culture and fertilization of the tomato, fertilizers for beans, and testing of onion, bean, and rhubarb varieties.

[Horticultural studies by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1939], pp. 16-20, 24-26, 37, 38, 42-46*).—Among studies the progress of which is considered are fertilizer requirements of vegetable crops, strain and variety tests of vegetables, culture and training of tomato plants, fertilization of the Rose Daphne, culture of *Lilium formosanum*, structure of the celery plant as influenced by the nitrate level in the solution, spraying of apples and tomatoes for the control of diseases, effect of sprays on the growth of young apple trees, and the sun-coloring of harvested apples.

Market quality and condition of California cantaloups as influenced by maturity, handling, and precooling, W. T. PENTZER, J. S. WIAIT, and J. H. MACGILVERAY. (Coop. Calif. Expt. Sta.). (*U. S. Dept. Agr., Tech. Bul. 780 (1940), pp. 74, figs. 34*).—In a study of means of improving the edible quality of California cantaloups by modifications in picking, handling, and shipping

methods, it was observed that in precooling melons from 80° to 50° F. the meltage of 1,000 lb. of ice was needed for each 4.8° of cooling. Precooling with mechanical refrigeration was somewhat slower than with ice and salt accompanied by the use of portable fans. A considerable saving in precooling costs was made by picking and loading melons in the early morning while they were relatively cool. The requirements for the successful shipment of hard-ripe melons included the prompt cooling of the top layers in cars to 55° or less and shipment under standard refrigeration so that the average transit temperature was 48° or lower. Precooling was not found necessary for fancy (half-slip) melons. Choice fruits (nearly eating ripe) were shipped successfully only when precooled to 45° or less or when loaded in the bottom layer of nonprecooled cars. Measured in terms of market behavior and eating quality, hard-ripe melons were best for eastern shipment. Fancy (half-slip) melons were poorer in flavor on arrival, although many of them ripened later with good quality. Choice melons were satisfactory for immediate consumption, but they lost flavor rapidly and were subject to decay. The coating of melons with wax had no apparent effect in retarding ripening and had no consistent effect on decay. Fumigation with nitrogen trichloride was effective in some cases in retarding decay.

Sweet-corn inbreds and crosses released by the Illinois Station, W. A. HUELSEN (*Illinois Sta. Bul.* 466 (1940), pp. 277-355, figs. 20).—Discussing the principles of corn improvement by inbreeding and recombination, the regional adaptability of crosses, etc., the author presents data on the characteristics and comparative yields of crosses involving eight Country Gentleman and four Narrow Grain Evergreen inbred lines. From the standpoint of yields of sweet corn, the superiority of good single crosses over good open-pollinated strains of the same variety was found to be chiefly a matter of greater yield uniformity from year to year and a significantly greater production of prime cut kernels per ton of unhusked ears. For example, during 6 yr., 1931 and 1933-37, including 3 yr. of severe drought, the coefficient of variability in yield of the well-adapted Cross 8 × 6 was 29.5 percent on the basis of tons of prime cut kernels per acre, as compared with 45.1 percent for the open-pollinated checks. During the same period the recovery of cut kernels per ton of unhusked ears was 22.6 percent higher from the cross. The yield of prime cut kernels was found a better estimate than that of sorted unhusked ears in determining the values of single crosses. Because of the segregation, mutation, and general deterioration of inbreds when removed to Idaho and Connecticut, seedsmen are now maintaining inbreds in the Middle West and having merely the crosses made elsewhere. Little progress was made toward improving crosses by means of selections within the inbred parents on the basis of physical characters. On the basis of field test, the various inbreds were classified as to their best use in crosses and recorded as compatible, incompatible, or antagonistic. Inbreds differed in quality, with No. 4 outstanding in its capacity to transmit quality, particularly in flavor. Most of the crosses were slightly earlier in maturity than the open-pollinated checks. Variation in smut resistance was observed in the inbred lines. In the Country Gentleman group, crosses of inbreds 8 × 6 and of 5 × 10 proved most desirable, and in the Narrow Grain Evergreen, Cross 14 × 13 was found most popular.

Fertilization of lettuce on alkaline-calcareous soils: Soil and plant studies, W. T. McGEORGE, M. F. WHARTON, and W. A. FRAZIER (*Arizona Sta. Tech. Bul.* 85 (1940), pp. [21]-397-451, figs. 13).—Part 1, by McGeorge and Wharton, discusses fertilizer experiments established in different producing areas which gave definite evidence that readily available forms of phosphate used alone

or in connection with N would greatly increase the yields of marketable heads. When an inorganic form of N (of low C:N ratio) was used in the mixture, effectiveness reached a maximum. Analyses of the soils showed that while lettuce makes a heavy initial demand on the soil there is a continuous need for available nutrients throughout the growing period. Analyses of the plants obtained from various localities showed surprisingly consistent composition, regardless of location or season. Both N and P fertilizers increased the contents of these elements in the plant, the most marked increases being noted on soils naturally low in these materials. Of the three major elements, K was apparently needed in the greatest amount, followed closely by N. Phosphate was needed by lettuce in smaller amounts and paralleled Ca absorption rather closely. Analyses of solid and of open heads showed no consistent differences in composition.

Part 2, by McGeorge and Frazier, confirms the earlier conclusion that ample supplies throughout the growing season of available phosphate and N are needed for maximum production of lettuce. All of various methods of applying fertilizer, namely, broadcast, drill, side dressing, and band, gave good results. In one trial 11-48 ammonium phosphate as a side dressing was significantly more effective than band placement. In another experiment, application in bands proved definitely more efficient than applications by drill with respect to N recovery, but only slightly more efficient in phosphate recovery. There was noted on the Mesa Experimental Farm a greater recovery of both N and phosphate by the spring crop than by the fall crop.

To grow a fall crop of lettuce, L. R. FARISH (*Miss. Farm Res. [Mississippi Sta.]*, 3 (1940), No. 8, p. 1).—General information is offered on the time of planting, methods of preparing the seedbed, varieties, etc. Based on observations over a period of years, the optimum planting date for fall head lettuce in central Mississippi is during the first few days in September.

English pea yields more than doubled by seed treatment, J. A. CAMPBELL (*Miss. Farm Res. [Mississippi Sta.]*, 3 (1940), No. 8, pp. 2).—Stating that the long-continued use of the soil in the Crystal Springs and Hazlehurst areas has increased soil-borne organisms and that unfavorable conditions in January and February add another handicap, the author discusses the results of experiments on seed treatment with fungicides. With check yields of 29.3 bu. per acre, certain of the treatments more than doubled the yields. The cost of the treatment was only 40 ct. per acre. The indications were that less seed would be required following treatment because of better stands.

Foliar diagnosis of differentially fertilized greenhouse tomatoes with and without manure, W. THOMAS and W. B. MACK. (*Pa. Expt. Sta.*). (*Jour. Agr. Res. [U. S.]*, 60 (1940), No. 12, pp. 811-832, figs. 7).—Analyses of the fifth leaf from the base of Marglobe tomatoes growing under greenhouse conditions with fertilizers applied as single elements, combinations of two or three elements (N, P, and K), or with and without dressings of manure showed that if yield is considered the criterion of the effect of fertilizer, then foliar diagnosis shows the course of nutrition with respect to the dominant fertilizer elements determining these yields. The order of yields in relation to fertilizer treatment was not the same in the manured and in the nonmanured series. In the nonmanured plats the highest yields were obtained with a complete fertilizer, while in the manured series phosphate and K without nitrate additions were most effective. In both manured and unmanured series increased additions of nitrate of soda reduced yields below those obtained with unit additions. In the unmanured series the four lowest-yielding plats were those which did not receive muriate of potash, and the foliar diagnosis showed

that the leaves of the two lowest-yielding plats had the lowest percentage of K throughout the cycle. Associated with the lowest yields were also the highest values for phosphoric acid throughout the cycle. In the unmanured series, because of far greater accumulations of phosphoric acid in certain treatments, a relationship existed between the intensity and yield only on the first sampling date. High yields were associated with high values for the intensities of nutrition in the manured series, and low yields with low values. The manured series as a group gave higher yields than the unmanured, and each manured plat had a higher yield than the unmanured plat receiving a similar application of commercial material. Relative to these facts, the foliar diagnosis showed that the increased yields in the manured plats were associated with higher intensities of nutrition throughout the cycle and with a great increase in the K of the NPK unit, but with N and phosphoric acid showing no consistent relationship.

The improvement of naturally cross-pollinated plants by selection of self-fertilized lines.—III, Investigations with vegetatively propagated fruits, D. F. JONES and W. R. SINGLETON (*Connecticut [New Haven] Sta. Bul. 435 (1940), pp. 325-347, figs. 11*).—Continuing this series (E. S. R., 74, p. 332), the authors discuss the theoretical aspects of inbreeding of heterozygous plants with a view to eliminating undesirable and intensifying desirable characters in the progeny and report on experiments with strawberries and raspberries.

In the work with strawberries involving five varieties, Howard 17, Chesapeake, Glen Mary, Marshall, and Progressive, inbreeding resulted in a reduction in size, viability, and reproductive capacity. Many of the inbreds were lost during the winter season. Abnormalities, such as the alteration of the flower bud into a proliferating mass of small leaves and defections in chlorophyll, were observed in some seedlings. The possible nature of the yellowing of strawberry foliage is discussed in some detail. Crossing of inbred lines restored vigor and size to full measure, and certain combinations of three or four inbreds were sufficiently promising to be named (Shelton and Hebron).

In raspberry breeding, Ranere, Columbian, and Cumberland were selfed from 1 to 3 yr. Ranere and Columbian seedlings showed marked reduction in growth. Cumberland black yielded selfed seedlings which retained full vigor and production through three generations of selfing. All three raspberries showed considerable segregation upon selfing. Since raspberry seedlings start free of mosaic, the technic may have promise for the development of true-breeding black raspberries as a nursery practice. Promising red-fruited raspberries were produced from hybrids of black and red raspberries backcrossed to reds. However, many of these produced neither root sprouts nor tip layers, limiting their increase. Hybrids from raspberry \times blackberry were more thorny than the parents and produced less fruit.

Longevity of pollen in apple, pear, plum, peach, apricot, and sour cherry, B. R. NEBEL (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 130-132*).—Continuing the investigation (E. S. R., 77, p. 784), some germination of apple pollen was recorded after more than 4 yr. of storage under optimum conditions. Both a tetraploid, Kola, and a diploid, Sutton, were represented in the long-life pollen. In the pear, one sample of Seckel survived 4.5 yr., indicating a similar life span for the pollen of the apple and pear. The pollen of the Grand Duke plum reached the 4.5-yr. stage. Peach and apricot pollens were not so durable, showing marked degeneration after 2 yr. of storage. Montmorency cherry pollen survived 5.5 yr., with tests still incomplete. Apple pollen which had lost all apparent viability in storage under ordinary room conditions was restored by transfer to cool storage at 50 percent relative humidity for 1 week.

Care of orchard in summer and fall for best results, T. E. ASHLEY (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 8, p. 8*).—Brief instructions are presented with reference to culture, pruning, spraying, and fertilization.

Soil atmosphere and the production of new rootlets by apple tree root systems, D. BOYNTON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 19-26, fig. 1*).—In the case of 1-year-old budded McIntosh and Delicious trees growing in 2-gal. glazed porcelain crocks with tight covers to permit the control of gas exchange, there was observed at soil temperatures between 55° and 70° F. a marked decrease in the formation of new rootlets as the O₂ level of the soil was reduced below 15 percent, particularly when the percentage of CO₂ was increased in compensating amounts. When the O₂ level dropped below 10 percent and the CO₂ increased to between 5 and 10 percent, so few rootlets were formed that top growth was markedly reduced. There was no consistent difference in the behavior of McIntosh and Delicious.

The severe trimming of the root systems accompanied by the removal of all roots smaller than 5 mm. in diameter resulted in the production of fewer new rootlets than were produced from unpruned root systems. The harmful effect of root pruning was particularly evident in plants with low O₂ supply. In the lowest O₂ series, from 5 to 10 percent O₂ and from 15 to 8 percent CO₂, severe trimming of the root system was accompanied both by a reduction in the number of new rootlets and of their total weight. Apparently, a higher O₂ level is necessary for the production of new rootlets than for the maintenance of life in existing roots. The results suggest the need of providing good aeration of the soil around newly planted trees.

Size relationships of trees of five varieties of apples on several clonal rootstocks, H. B. TUKEY and K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 299-304, figs. 2*).—Stating that in the Northeast there is an interest in apple trees smaller than the so-called standards, the authors present data on the comparative development at the end of the seventh growing season in trials at Geneva and Ithaca, N. Y., of five varieties—Baldwin, Delicious, Early McIntosh, McIntosh, and Northern Spy—on various clonal rootstocks and on French crab seedlings. Apparently, several factors, environmental as well as inherent, were concerned, but there was evident a general tendency with all varieties for a given rootstock to produce trees of the same general size. Malling IX, for example, produced consistently small trees, and USDA 227 produced consistently large trees. Malling I and XIII tended to produce intermediate trees. There was noted a somewhat parallel behavior of the same stock and scion combinations at the two locations, with a greater range of size differences at Geneva than at Ithaca.

The growth and production of topworked apple varieties, T. J. MANEY. (Iowa Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 287-290*).—Records taken in 1939 in an orchard at Ames, Iowa, comprised of several varieties of apple top worked in 1925 on own-rooted trees of Virginia Crab and Hibernial showed the varieties, in practically all cases, to have made more growth and production on Virginia Crab than on Hibernial. Records taken on Jonathan trees on various stocks, including the conventional French crab seedlings, showed considerable variability in growth and production related to the stocks. Average height ranged from 9 ft. for Jonathan on Dudley to 16 ft. for Jonathan on Virginia Crab. Production totals for 2 yr., 1938 and 1939, varied tremendously.

That intermediate stocks may exert a profound influence on the tree was shown in the case of Virginia Crab intermediates. The Paragon trees averaged 19 ft. tall, and the Mammoth Black Twigs only 9 ft. Virginia Crab was

found highly incompatible with Stayman Winesap and partly so with Winesap. The results indicate the need of careful studies of the compatibility of stock and scion combinations before making general conclusions.

The effect of reaction of the nutrient solution on apple seedlings growing in sand, L. J. EDGEWORTH. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 7-10, fig. 1).—Seedlings of McIntosh and Delicious, grown in sand supplied with nutrient solutions the pH of which was varied over a wide range, showed essentially the same growth throughout the series. Determinations of the total N content of the seedlings showed little effect of the reaction differences on this constituent. Apparently, the amounts of phosphate buffer added to maintain the different pH levels were not sufficient to interfere with the normal growth. From the results it was evident that apple seedlings were tolerant to H-ion concentrations over a wide range, those of the experiment being from 3.6-3.9 to 6.6-6.5.

Germination and growth of crab-apple seedlings (*Pyrus baccata*) as influenced by fungicidal treatment, L. L. DAVIS. (S. Dak. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 359, 360).—Although Siberian crab apple is conceded to be highly desirable as a rootstock for the apple in South Dakota, low-percentage germination and slow growth have impeded its use. Treatment before stratification with various fungicides failed to give significant benefits in germination, except possibly in the case of one Cu compound where the average germination was 7.5, as compared with 28 percent for the control lot. There was no indication that the Cu stimulated the growth of the resulting seedlings, but results may have been masked by severe drought conditions during the growing season.

The effect of time of nitrogen application upon the response of Jonathan apples, E. L. OVERHOLSER and F. L. OVERLEY. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 81-84).—In experiments conducted over the period 1927-36 and in which N was applied at different times of the year at the rate of 1 lb. of actual N per tree (half from nitrate of soda and half from ammonium sulfate) it was evident that the best times to apply N to Jonathan trees on Cashmere sandy loam near Wenatchee, Wash., are in February and December. Applications in September, especially nitrate of soda, may be partly lost by leaching. Applications in April and July were the most unsatisfactory of the types tested, chiefly because of their effect in depressing red color development in the fruit. N applications in July and September apparently increased preharvest dropping. The shortest terminal growth was associated with September applications. Firmness of flesh, as measured by the pressure test, was little influenced by the time of applying N.

The effect of certain forms of nitrogen carriers upon the response of Rome Beauty apples, F. L. OVERLEY and E. L. OVERHOLSER. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 78-80).—In an experiment begun near Wenatchee, Wash., in 1929 in a then 23-year-old Rome Beauty orchard located on Cashmere sandy loam there was little evidence that annual applications of N in various forms (calcium nitrate, calcium cyanamide, ammonium sulfate, and whale meat and blood) had any material effect on growth or yield. The orchard had a good alfalfa cover crop in the beginning which was gradually killed by heavy disking and was replaced by grass and weeds. The form of N appeared to be of little significance, leading to the practical suggestion of using the most economical material available. The depressing effects of N on red color development were not as evident in Rome Beauty as in Jonathan.

A study of lateral movement of potassium and phosphorus in an orchard soil, I. W. WANDER and J. H. GOURLY. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 27-31, figs. 9).—In an orchard located partially on well-drained Wooster silt loam and partially on the less well-drained Canfield silt loam, potassium sulfate and superphosphate were placed in holes systematically arranged around certain trees. After 3 yr., trenches were dug adjacent to certain of the holes, and samples of the soil were collected at measured distances from the original placement. Quick tests for K showed marked lateral movement, large amounts being found in some instances as far as 9 in. from the original hole. Quantitative tests of exchangeable K indicated the same general trends, although they did not follow exactly the results of the quick tests. On the other hand, both quick and quantitative tests for P showed very little, if any, lateral movement of available P. In every instance there was observed a considerable accumulation of roots intermingled with the fertilizer and sand in the holes.

Variations in potassium content of the foliage from certain New York orchards, W. REUTHER and D. BOYNTON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 32-38, figs. 2).—Samples of leaves collected throughout the very dry summer of 1939 from the station orchard showed the amount of K to be rather constant until about September 1, when migration of the element from the leaves began. The percentage of K in the dry matter decreased fairly uniformly throughout the entire summer. Injury to the leaves induced by sprays, fertilizers, and other causes was found to have little effect on the percentage of K in the dry matter, suggesting that there should not be any material difficulty in distinguishing between necrosis due to K deficiency and that due to other causes. Based on analyses of samples of leaves collected in 26 normal-bearing McIntosh orchards, it was evident that there is a considerable variation in the percentage of K in the foliage of apparently normal trees. Where samples of foliage were taken from the McIntosh trees affected with some degree of marginal scorch and staining, the percentage of K in the dry matter was very low. Studies were begun to determine the effects of K applications upon these low-K trees.

Frost rings in fall fertilized McIntosh apple trees, W. W. SMITH and M. A. TINGLEY. (Univ. N. H.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 110-112, fig. 1; also *New Hampshire Sta. Sci. Contrib.* 77 (1939), pp. 110-112, fig. 1).—Observations on samples of wood taken on October 28, 1938, from McIntosh trees which had received highly different amounts of N fertilizer in the fall of 1937 showed an absence of severe frost rings in the control trees and in individual trees a greater number of frost rings on the north side of the tree. The number and severity of frost rings apparently was related to the amount of N applied, although some abnormal xylem was found in unfertilized trees. The more frequent occurrence of rings on the north side of the tree may have been due to less stored carbohydrates or to the fact that temperature may be actually lower than on the southern exposure.

Spraying with plant growth substances for control of the pre-harvest drop of apples, F. E. GARDNER, P. C. MARTE, and L. P. BATJER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 415-428).—Having noted that applications of certain growth substances tended to delay abscission of certain plant parts, such as nonpollinated holly berries (E. S. R., 78, p. 761), the authors conducted experiments with apple trees, using a large number of different compounds, to discover the possible effects on fruit abscission. To reduce variability due to tree individuality, limbs on single trees were used in certain cases. More than 30 separate spraying experiments were conducted with 20-

odd varieties. Of the various chemicals tried, naphthaleneacetic acid and naphthaleneacetamide were outstanding in effectiveness, differing very little, if any, in potency. The use of both materials, when applied at 0.0001 percent (1 p. p. m.) appreciably reduced dropping. A concentration of 0.0005 percent of either compound applied at the right time is advised as a practical treatment. The duration of the effect of the chemical, as well as the degree of effectiveness, varied with varieties. Instead of a 2- to 3-week period of effectiveness, as for most varieties, McIntosh was in a class by itself, the effect diminishing rather abruptly after 8 or 9 days. In studies of different methods of application, the desirability of thorough spraying of trees with particular effort to contact the fruit was indicated.

The McIntosh drop, L. SOUTHWICK (*Massachusetts Sta. Bul. 372 (1940), pp. 19, fig. 1*).—Stating that the premature dropping of McIntosh is a serious problem for growers, reaching, at times, 50 percent or more of the crop, the author discusses experiments conducted to determine the underlying factors involved. Dropping was more extensive under cultural conditions which made for abundant soil nitrates, particularly late in the season. Heavy mulching, organic or mineral N applications, late cultivation, and injections of N into the tree all tended to increase the percentage of drop in the preharvest period. On the other hand, a low fertility level, sod culture, limited cultivation, low tree vigor, and late summer girdling tended to decrease dropping. In many cases, dropping was found to increase with larger crops per tree. In a planting of McIntosh on clonal rootstocks there was some indication that dropping varied with the different stocks, but not necessarily according to their vigor. Records taken over a 3-yr. period showed a positive correlation between the seed number and the date of drop of apples from individual trees. On any particular tree the apples with many seeds tended to hang longer than those with fewer seeds. Length of stem was not found an important factor in the dropping of McIntosh. There was no indication that mineral content of the fruit was concerned. No positive evidence was found that could definitely associate varietal strains with dropping tendency. Attempts to correlate various weather factors with dropping gave somewhat doubtful results, although there was some indication that high temperature may increase dropping. The recent work of Gardner, Marth, and Batjer, noted above, on the use of certain chemicals to delay fruit abscissions is cited.

Origin of mechanical injuries to apples, C. W. ELLENWOOD (*Ohio Sta. Bimo. Bul. 205 (1940), pp. 115-118*).—Continuing observations in 1939 (E. S. R., 82, p. 49), the author records data on five varieties—McIntosh, Jonathan, Baldwin, Delicious, and Stayman Winesap—all of which showed more bruises on fruits graded over mechanical sizers than on those graded by hand. The belt-type grader caused fewer bruises in most cases than did the weight-type machine. There were slightly more skin injuries in basket- than in crate-handled fruits. McIntosh was particularly susceptible to bruising, Jonathan and Stayman Winesap rather susceptible, Baldwin and Delicious reasonably resistant.

Cork experimentally produced on Northern Spy apples, A. J. HEINICKE, D. BOYNTON, and W. REUTHER (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc., 36 (1939), pp. 47-52, figs. 2*).—The excessive irrigation from August 25 to November 14, 1938, of a normal 27-year-old Northern Spy tree which had borne disease-free crops for many years caused no symptoms of abnormality in the fruits or foliage in 1938. However, when irrigation was continued the following year, April to August, there was curling of the leaves, and by the middle of June the fruits showed the characteristic early symptoms of surface cork. Internal

corky tissue was also observed. The leaves later showed pronounced scorch, with some abscission. Not all the fruits or all the leaves were affected, but at least half of the branches bore injured fruits.

An analysis of gases extracted from wells dug under the trees showed a rapid decline in O_2 following heavy irrigation. Analyses of the foliage showed a reduced percentage of ash in the dry matter and of the B in the ash and the amount of B in each leaf. There was an even greater reduction in the K content. N was low, also, as compared with the controls. Apparently the lack of O_2 in soil interfered more with the absorption of K than it did with other elements.

Experience with color development of apples after harvest, E. P. CHRISTOPHER. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 44-46).—McIntosh apples harvested September 18, when not over 5-10 percent of the surface showed stripes of red, scalded badly when placed beneath one layer of cheesecloth. With another lot under five layers of cloth, no scalding occurred, and markedly improved color was secured. As indicated in December after storage, the sun-colored fruits had higher quality than those stored directly from the tree. Favorable results were also secured with Cortland, Baldwin, and Northern Spy. Oilcloth proved a better light-reflecting medium for placing beneath the coloring frames than did either gravel, paper, or grass.

Progress report on identification of peach varieties by leaf characteristics, E. M. MEADER and M. A. BLAKE. (U. S. D. A. and N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 203-207, fig. 1).—Presenting further data (E. S. R., 80, p. 490) on the usefulness of certain leaf characters in the identification of peach varieties, the authors describe seven varieties—Belle, Candoka, Elberta, Hiley, Illinois, Smock, and South Haven—with reference to length : width ratios, angles of base and of apex, and conformation. The mean width : length ratio was found the most reliable of the measurements. Leaves of 6- to 7-in. length, taken from the midportion of vigorous unbranched terminal shoots, were found most desirable when available. Other characters of the leaf, tree, and fruit were also valuable in identification, but sufficient work was done with leaves to indicate that their study is very much worth while in the identification of peach varieties.

45 plum varieties in station tests—some recommended, C. H. RAGLAND (*Miss. Farm Res. [Mississippi Sta.]*, 3 (1940), No. 8, p. 7).—Together with brief notes on quality, productivity, etc., a list is presented of varieties which have proved promising.

The effect of yields upon the apparent drying ratios of French prunes, A. H. HENDRICKSON and F. J. VEIHMAYER. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 178-182).—As part of an experiment on the irrigation of the French prune, ratios between the weight of the harvested fruit and the weight following drying were determined for the various plats. The records showed, on the average, only relatively small differences in drying ratios among the various irrigation treatments in any 1 yr. In fact, in several cases the drying ratios of the fruits from unirrigated plats were equal to or greater than those from irrigated plats. Apparently, a close relationship existed between yields and drying ratios, suggesting that in years of small crops the trees may have sufficient leaf area to produce fruits with a low drying ratio, while in years of heavy production this was not the case. This hypothesis was confirmed by severe thinning of certain trees, the fruits of which had lower drying ratios than those of the controls.

Sour cherry rootstocks, L. R. BRYANT. (Colo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 322, 323).—In a planting of Montmorency cherry trees on mazzard and mahaleb rootstocks, significantly greater mortality at the

end of five seasons was recorded in the mazzard-rooted trees. Based on trunk measurements, the mahaleb-rooted trees had made significantly greater growth. Chlorosis was more evident in the mazzard-rooted trees.

Bramble fruits: Raspberries, blackberries, and dewberries, A. S. COLBY, H. W. ANDERSON, and W. P. FLINT (*Illinois Sta. Cir.* 508 (1940), pp. 72, pl. 1, figs. 35).—This is a revision of Circular 427 (E. S. R., 72, p. 778).

Relation of number of leaves in November to number of flowers the following spring in the Blakemore strawberry, E. B. MORROW and G. M. DARROW. (N. C. Expt. Sta. and U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 571-578).—Records taken on spaced plants growing in single-, double-, and triple-row beds showed an increase in the number of flowers per plant for each increase in size of plant as measured by the number of leaves present on the preceding November 15. In plants above the 6- to 10-leaved group there was a decrease in the number of flowers per leaf as the number of leaves per plant increased. Apparently, plants averaging 7 or 8 leaves were the most efficient flower producers under the conditions of the study. The effect of age of plant appeared to be chiefly a matter of plant size, as measured by the number of leaves. The older plants produced the greater number of leaves and flowers, although the younger plants produced more flowers per leaf. The difference in efficiency is attributed, in part at least, to the greater competition for nutrients among the older and larger plants.

The effect of ice upon the survival of strawberry plants, W. G. BRIERLEY, R. H. LANDON, and R. E. NYLUND. (Minn. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 557-563).—That the injury to strawberry plants attributed to ice smothering during the winter is more likely the result of low temperatures or excessive water at the time of growth resumption or of disease was concluded from the results of investigations in which plants were coated with ice or enclosed in ice-covered cylinders or in sealed jars, the internal atmosphere of which was altered with respect to CO₂ and O₂. Beaver plants sealed in jars and exposed at -3° C. (26.6° F.) for 1 week to concentrations of CO₂ ranging from 2.7 to 7.3 percent showed some retardation of growth when placed in the greenhouse but soon resumed vigorous development. Since laboratory experiments showed that a coating of ice and of frozen water-saturated soil are both highly impermeable to CO₂ and O₂, it is conjectured that plants in the field are exposed frequently under natural conditions to abnormal atmospheres without suffering serious injury.

The influence of straw mulch on strawberries, J. E. VAILE (Ark. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 567-570).—Observations on the behavior of mulched and nonmulched plants of 19 varieties showed significantly more severe winter killing of plants and crowns and greater flower killing by late frosts and freezes in the nonmulched areas. The difference in flower killing was greater in early-blooming than in late-blooming varieties. Early-blooming strawberries as a group were more productive when mulched. Late-blooming varieties failed to show this gain in yield, a situation attributed to the probable occurrence of late-opening cluster buds not revealed at the time of recording injured flowers. Varieties which showed the greatest benefit in 1939 from mulching, from the standpoint of crown survival, were Fairfax, McClinton, Grand Champion, Howard 17, and Catskill. The greatest yield gains from mulching were recorded in the 3 early-blooming varieties, Fairfax, Howard 17, and Dorsett. It was apparent that mulch did not protect all varieties in the same manner or to the same degree. In replicated trials with Blakemore, significant benefits were recorded from mulching with respect to plant and crown survival, decreased flower killing, and increased yields.

Tennessee Supreme strawberry, L. A. FISTER and B. D. DRAIN (*Tennessee Sta. Cir.* 68 (1940), pp. 4, figs. 3).—A description is presented of a new variety originated by the station from a cross of Missionary \times Howard 17. The variety is characterized by resistance to leaf and root diseases, tolerance to drought, productiveness, good color, high U. S. No. 1 percentage of the fruit, and adaptability for freezing preservation.

Quantitative relationships between leaf, branch, and root systems of the Valencia orange tree, S. H. CAMERON. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 125, 126, fig. 1).—Records averaged for 32 9-year-old unpruned Valencia orange trees, tops from buds of a single parent tree, and roots of single clones showed the leaves, twigs, trunk and branches, large roots, and rootlets to comprise, respectively, 25.2, 9.4, 44.5, 19.7, and 1.2 percent of the green weight of the trees. The average was used because there was no significant difference between the trees. The weight of leaves fluctuated sharply during the season, attaining a maximum in May and June and a minimum in February. Differences in weight of leaves noted from year to year were attributed to the limiting effect of production on vegetative development.

Growth of own-rooted and budded citrus trees, F. F. HALMA. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 279–282, figs. 3).—Measurements taken on Eureka lemons and navel and Valencia oranges on their own roots and propagated on grapefruit, sweet orange, and sweet orange, respectively, showed that the lemon trees grew more rapidly when on their own roots than when on grapefruit. In the navel orange the results were practically neutral, with slight superiority for own roots in one plot. A similar inconsistency was exhibited by the Valencia trees, indicating that environmental factors may be more potent than the inherent nature in determining response.

Nitrate concentration and ion balance in relation to citrus nutrition, H. D. CHAPMAN and G. F. LIEBIG, JR. (*Hilgardia* [California Sta.], 13 (1940), No. 4, pp. [1]–141–173, pls. 2, figs. 8).—Stating that whereas from 150 to 250 lb of N are applied annually per acre in citrus orchards there is an actual utilization by tree and fruit of not more than from 35 to 50 lb., the authors discuss the results of experiments to determine the minimum maintained concentrations of nitrate N needed for the optimum growth of citrus plants. In sand culture studies with sweet orange seedlings, plants with 0.14, 0.7, and 1.4 p. p. m. of N all showed typical symptoms of N starvation. Plants with 7 p. p. m. were green and vigorous and made almost as good growth as those with 70 p. p. m. When the concentration was increased to 840 p. p. m., growth was markedly reduced, and the leaves were markedly injured. Low concentrations of N were found effective in sulfate, chloride, and cation concentrations. Apparently, a balance between Ca and K favorable for K absorption exerted a favorable influence on nitrate absorption. Increased chloride and sulfate concentrations did not depress nitrate absorption or utilization. It was apparent that the increased absorption of K in proportion to that of Ca served in some manner to offset the potentially depressing effect of sulfate and chloride. With increasing and equivalent concentrations of both Ca and K in the nutrient solution, the absorption of Ca decreased and that of K increased. Increased nitrate concentration did not depress phosphate absorption. Plants not retarded in growth by a lack of N but supplied with various nitrate concentrations showed no significant evidence of decreased P absorption. It is suggested that Ca–K relations are probably important in influencing various ion-pair relations. When nitrate is used as the nutrient source of N the best criterion of excess is the accumulation of nitrate in the plant. From the

results the authors suggest that in the orchard it might be better to supply N in frequent small applications rather than in less frequent large amounts. The reduced losses in leaching and volatilization might well offset the additional cost of frequent applications.

Studies of grapefruit fertilization in Arizona, A. H. FINCH and W. T. McGEORGE. (Univ. Ariz.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 62-67, fig. 1).—In January 1936 an orchard of Marsh grapefruit trees, located on the Yuma Mesa, which had received uniform applications of stable manure from the time of planting in 1928 and which was in vigorous condition was divided into plats and treated with differential fertilization. Yields recorded for the following 3 yr. showed the striking effects of commercial N. Differences in yield among the various kinds and combinations of commercial N-carrying fertilizers apparently were not significant. K and P used alone or in combination with forms of N had little influence on yield. The use of more than the basic application of 3 tons of manure was not beneficial, and, in fact, 3 tons gave only slightly larger yields than none. The fruit on all plats was coarse and of mediocre commercial quality. Analyses of the leaves for N, P, Ca, and ash showed all trees receiving commercial N to be very similar in composition whether N, P, or K was added. The percentage N content was highest on the plats receiving commercial N, and this content was correlated with productivity. The percentage P was not correlated with P application but was rather negatively associated with the application of N-carrying materials. The percentage of Ca in the leaves was also more closely correlated with N content than with Ca applications. The leaves of trees receiving commercial N contained more ash, N, and Ca and less P than trees not receiving commercial N.

Soil moisture, root distribution, and aeration as factors in nut production in western Oregon, C. E. SCHUSTER and R. E. STEPHENSON. (Coop. U. S. D. A. et al.). (*Oreg. Sta. Bul.* 372 (1940), pp. 32, figs. 10).—Studies in a large number of orchards located on a number of different soil types indicated that under favorable conditions with respect to moisture and aeration the roots of walnut trees penetrate deeply and form a well-developed root system. Soils supporting the largest trees permitted free development of roots and free movement of moisture into the roots to a depth of soil of 8 or 10 ft. From 10 to 12 percent by volume of noncapillary pore space provided open spaces for the exchange of air and for easy root penetration. Heavy, waterlogged soil inhibited root development and limited the function of any roots that penetrated deeply. Upward movement of water from subsoils is probably both slow and, in most cases, limited in amount. There was noted a more or less uniform extraction of moisture at the different levels by trees with well-developed root systems. While not less than 5 or 6 ft. of effective soil depth may permit successful nut production, from 8 to 10 feet of penetrable aerated soil is conceded much more favorable. Under the climatic conditions of western Oregon, cover crops must be worked into the soil in early April, and the stored soil moisture conserved for the trees. Measurements of usable soil moisture cannot be restricted to the surface horizons but must include the moisture-root relations of the deep horizons as well.

Selected list of woody ornamental plants for Ohio, L. C. CHADWICK (*Ohio Sta. Bimo. Bul.* 205 (1940), pp. 135-143).—Lists are given of recommended plants arranged by types, such as vines, ground covers, shrubs, trees, and narrow-leaf and broadleaf evergreens. The upright types are further subdivided according to their expected height at maturity.

FORESTRY

[Forestry studies by the Georgia Station]. (Partly coop. U. S. D. A.). (*Georgia Sta. Rpt. 1940*, pp. 88, 89).—Included are brief statements on studies of the influence of various types of seedbed treatment on germination and survival of yellow poplar, spacing and rate-of-growth trials with white pine, testing of chestnut seedlings, and the effect of phosphate on newly set black locust trees.

Survival and growth of slash pine from different grades of planting stock, D. J. WEDDELL (*Alabama Sta. Rpt. 1938*, pp. 21, 22).—Comparing stock plants from 10 to 16 in. tall with smaller stock, the author recorded much better survival and height growth after two growing seasons for the larger stock.

Effect of certain chemical attributes of vegetation on forest inflammability, L. W. RICHARDS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 60 (1940), No. 12, pp. 833–838).—The work here noted, carried on at the Priest River Experimental Forest in northern Idaho, forms part of a three-phase study to ascertain measurable factors for fire-danger rating. The use of crude-fiber values, considered as a partial measure of fuel content, was abandoned because of a lack of significant variations corresponding to changes in fire behavior. Moisture content, calorific value, and crude fat (total ether extract) were determined on samples taken at 10-day intervals during the fire seasons of 2 successive years. Moisture content, which showed a wide range of variation, was apparently the most important factor affecting fire behavior. It is noted, however, that, "as critical fire conditions develop, factors other than total free moisture may gradually assume increased importance. The tenacity with which a given plant holds its free or chemically combined moisture may determine whether it exerts a retarding effect, no effect, or an accelerating effect on the rate of spread of forest fires." It is considered not to be possible, as yet, to relate the observed differences in calorific value with the effect of the vegetation on rate of fire spread. Only snowbrush and pinegrass, among the several species examined, showed marked variation in calorific value through the periods studied. With respect to the crude-fat data, it is noted that as a rule the calorific values of the crude fats are considerably higher, and their ignition temperatures are measurably lower, than those of cellulose. Any significant change in either quantity or nature of these constituents might readily alter the burning properties of the plants.

Cost of producing white pine lumber in New England, V. S. JENSEN, C. E. BEHRE, and A. O. BENSON (*U. S. Dept. Agr. Cir. 557* (1940), pp. 40, figs. 12).—Discussing the history and significance of white pine production in the Northeastern States, the authors stress the need of a forest management policy which would provide a continuous supply of large, high-quality timber. Studies of six typical white pine lumbering operations at various locations in Maine, Massachusetts, and New Hampshire are described and discussed in detail. Log size, which is directly related to tree size, was the most important of various factors determining the costs of lumber production, the grade of lumber, the margin for profitable operation, and the price which could be paid the owners for stumpage. In the Waterboro, Maine, operation, which represented a fair average of conditions on the six projects, the highest returns were obtained from 17-in. logs. Large logs and trees not only were harvested more efficiently but also produced a much larger proportion of high-quality lumber. Small logs yielded mostly low-grade material salable only for boxboards or similar products. It was evident that under the usual conditions lumber cannot profitably be manu-

factured from trees less than 10 in. or logs less than 8 in. in diameter. Partial cutting, involving the selection of the larger trees, had certain advantages, namely, the production of a higher proportion of high-quality lumber, the maintenance of the stand, a reduction in fire hazard, etc. In one operation where part of the trees had been pruned, there was a notable increase in the output of the better grades of lumber. Data on certain of the operations showed that square edging of the lumber, though reducing the total output, materially increased the sale value and net returns. The value of grading lumber rather than selling it as mill run was indicated. The more effective disposal of slabs, sawdust, and other waste material is suggested as a means of increasing returns. Recommendations for the management of white pine forests on a sustained production basis are included.

Hardwood resources and industries in Arkansas, H. GARLAND (*Arkansas Sta. Bul. 404* (1940), pp. 50, figs. 20).—Based on personal observations, interviews with mill operators and industrial consumers, and on published data, a picture is presented of the present situation, and plans and policies which would tend toward permanency are suggested. At present, small ownerships of second-growth hardwoods, rarely managed for sustained yields and cut for immediate cash returns without view to the future, have resulted in inefficient use and depletion of Arkansas hardwoods. The efficient use of hardwood logs is confined to a few large mills in the bottom lands. There is need for an effective State-wide fire protection plan and for education of forest owners and dwellers to the possibilities in good management. The establishment and general acceptance of grades for sawlogs and nonlumber raw material would lead to more effective marketing by the owner and better utilization by the mills. It is suggested that the mills should purchase or control sufficient forest areas to assure sustained yields of raw material. Cooperative forest management is suggested as an alternative to large single ownerships. Large areas of depleted forest are a major problem, suggesting the need of public management to restore them to a worth-while status.

Volume tables for some Arkansas hardwoods, R. D. STEVENS (*Arkansas Sta. Bul. 396* (1940), pp. 46, fig. 1).—Based on direct measurements of felled trees on logging operations in various sections of the State, volume tables are presented for different species and types of hardwood. The tables are based on length of bole and Doyle, Scribner Decimal C, and International $\frac{1}{4}$ -Inch log rules. Where data were available, cordwood volumes from limbs and tops are included for each species under its volume table for the Doyle log rule. In the volume tables the data are rounded to the nearest 5 bd. ft. except in the case of Scribner Decimal C tables, which are constructed by rounding to the nearest 10 and dropping the cipher. Miscellaneous tables include data on the volume in linear feet of stave material for bottom-land hardwoods most commonly used for slack stave stock and for tight stave utilization in old-growth upland white oak.

DISEASES OF PLANTS

Insect transmission of plant diseases, J. G. LEACH (*New York and London: McGraw-Hill Book Co., 1940, pp. XVIII+615, [pl. 1], figs. 238*).—In this volume the author has endeavored to bring together the most important contributions in this field of study hitherto found only in widely scattered contributions, to evaluate and interpret the evidence in the light of the more recent advances in entomology and plant pathology, and to emphasize the importance and promise of the subject as a field of study and research. Following an introductory chapter, the main subjects dealt with are the interrelationships of plants and insects; symbiosis between insects and micro-organisms and its significance in plant pathology;

relation of insects to the spread and development of plant diseases; plant diseases caused by toxicogenic insects; insects in relation to diseases due to bacteria, fungi, viruses, and phytopathogenic protozoa; mites, nematodes, and other small animals as vectors of plant diseases; the anatomy and physiology of plants in relation to infection and insect vectors, and of insects in relation to the transmission of plant diseases; the inocula of plant pathogens in relation to insect transmission; feeding and breeding habits of insects in relation to the transmission of plant diseases; insect transmission of animal diseases compared with that of plant diseases; and methods of studying insect transmission of plant diseases. Tabulations of certain facts pertinent to the subject appear in an appendix, a glossary and a subject index are provided, and literature references occur at the ends of individual chapters.

Handbook of plant diseases, VI, founded by P. SOBAUER (*Handbuch der Pflanzenkrankheiten*. Berlin: Paul Parey, 1939, vol. 6, pts 2 and 3, pp. 208, figs. 68).—Part 2 of this monograph series (edited by O. Appel, with the collaboration of W. Fischer, G. Hilgendorff, H. Sachleben, E. Riehm, W. Trappmann, A. Winkelmann, and H. Zillig) continues discussions of the control of plant diseases and pests (E. S. R., 81, p. 47), with a consideration of biological methods through the use of micro-organisms, vertebrates, and insect parasites. Part 3, the technical means of plant protection, takes up in detail the various methods and apparatus for disinfection (moist and dry), dusting, and spraying.

Report of the 1940 annual meeting of the Pacific division of the American Phytopathological Society (*Phytopathology*, 30 (1940), No. 9, pp. 784-791).—Abstracts of the following papers are given: Greenhouse Experiments for Control of Seedling Diseases of Sugar Beets, by M. M. Afanasiev and H. E. Morris; The Use of Calcium Cyanamid and Other Fertilizer Materials and Soil Amendments in the Destruction of Apothecia of *Sclerotinia fructicola* with Methods of Application, by K. Bauer and G. A. Huber; A Canker and Die-back Disease of Overwintered Youngberry and Boysenberry Canes, by E. C. Blodgett; The Strip Method of Soil Treatment for the Control of Black Root of Sugar Beets, by L. Campbell; Occurrence of Big Bud of Tomato in the Pacific Northwest, and Resistance and Susceptibility to Curly Top in Varieties of Common Bean, *Phaseolus vulgaris*, both by B. F. Dana; A Preliminary Report on the Inheritance of Resistance to Rust (*Uromyces appendiculatus*) in Beans (*Phaseolus vulgaris*), and A New Factor for Resistance to Powdery Mildew (*Erysiphe polygoni*) in Beans (*Phaseolus vulgaris*), both by B. Dundas; Curly-Top Virus Strains, by N. J. Giddings; The Origin and Inheritance of M Types in *Hypomyces*, by H. N. Hansen and W. C. Snyder; California Regulatory Laws and Fruit-Tree Viroses, by J. L. Hewitt; Net Necrosis of Potato in Western Washington, by G. A. Huber; The Stony-Pit Virus of Pears, by J. R. Kienholz; Influence of the Pathogen, Environment, and Host Response on the Efficacy of Seed Treatment With Sugar Beets and Some Vegetable Crops, by L. D. Leach; Separation of Tulip 1 Virus From Lily-Latent by Cytological Methods, by F. P. McWhorter; A *Phytophthora* Disease of *Chamaecyparis*, by J. A. Milbrath; Camellia Yellow Spot—A Virus Disease, by J. A. Milbrath and F. P. McWhorter; Further Studies on the Comparative Efficacy of Bordeaux Mixture and Some "Insoluble" Copper Sprays for the Control of Walnut Bacteriosis in Oregon, by P. W. Miller; Rusty-Mottle, A New Virosis of Cherry, by E. L. Reeves; A Sweet Clover Ring Spot From Alsike Clover (*Trifolium hybridum*), by S. Rich; An Apparently Undescribed Storage Rot of Grapefruit, by R. B. Streets; Results of Three Years' Treatment of Pecan Groves for Control of *Phymatotrichum* Root Rot, by R. B. Streets and L. A. Brinkerhoff; The Increase of Tobacco-Mosaic Virus and the Changes Accompanying Nitrogen Compounds in Detached Tobacco Leaves, by W. N. Takahashi;

Graft Transmission, Persistence and Migration of Some Viruses in Fruit Trees, by H. Earl Thomas; Tulip Anthracnose, by C. M. Tompkins and H. N. Hansen; Low Germination of Peas Associated With the Presence of Bacteria in the Seed, by W. J. Virgin; Therapeutic Action of Vapors From Sulphur Compounds, and Cultural Separation of Some Obligate Parasites, both by C. E. Yarwood; and A Phycomycete Affecting Roots of Raspberry, by S. M. Zeller and A. J. Braun.

[Phytopathological papers] (*Iowa Acad. Sci. Proc.*, 46 (1939), pp. 119-125, 179, 180).—The following are included: Diseases of Cultivated Lupines, by C. J. Gould, Jr. (pp. 119-125), and Studies in the Redistribution of Some Phytopathogenic Species of *Bacillus*, by E. L. Waldee, G. C. Kent, and I. E. Melhus (pp. 179, 180) (both Iowa State Col.).

Diseases of plants in the United States in 1938, N. W. NANCE (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 1939, Sup. 119, pp. 119-289, figs. 23).—This report follows the general plan of previous summaries (E. S. R., 82, p. 58), including weather data (see p. 12). Potato late blight, psyllid yellows, ring rot, and *Phytophthora* pink rot and wilt; leaf rust of wheat; northwestern apple tree anthracnose in Maine; persimmon wilt; and Dutch elm disease were noteworthy from the standpoints of severity, wide incidence, or extension of range.

The Plant Disease Reporter, [September 1 and 15, 1940] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 24 (1940), Nos. 16, pp. 337-346; 17, pp. 347-359, figs. 3).—The following items of interest to phytopathology are included:

No. 16.—Mild streak disease of black raspberries in Maryland, by M. W. Woods and I. C. Haut; yellow-red virosis on chokecherry in Illinois, by H. W. Anderson and H. F. Seifert; tomato diseases found in western Tennessee in 1940, by M. C. Richards; incidence of wheat foot rots in Kansas and Colorado, by H. Fellows; foot and root rots of small grains and grasses in the Dakotas, by R. Sprague; new records of charcoal rot on hardy phlox in Illinois, and spotted wilt outbreak on tomatoes and peppers in Pennsylvania; and brief notes on bitter rot of apples in southern Illinois in 1940 and dwarf smut prevalent on wheat in Montana.

No. 17.—Present status of the Dutch elm disease; the status of onion blot in 1940, by A. G. Newhall and B. G. Chitwood; the nematode *Eucephalobus caryuroides* apparently causing disease of tobacco roots, by T. W. Graham; Crown injury on peach trees in New York, by M. B. Hoffman; origin of outbreaks of peach leaf curl, by W. D. Valleau; check list revision notes, by F. Weiss; and brief notes on unusual severity of dodder in Virginia and powdery mildew on rose in Connecticut.

Plant pathology (*Arizona Sta. Rpt. 1939*, pp. 88-95, figs. 4).—Progress notes are included on control of fungus fruit rot of dates by spraying; incidence of and seed treatment for angular leaf spot of cotton; *Phymatotrichum* (Texas or cotton) root rot, including chemical treatments and new methods of applying them, barriers by injection, and field surveys for incidence (coop. U. S. D. A.); and studies of *Fusarium* and bacterial wilts of cantaloups, cantaloup fruit disinfection, *Macrosporium* leaf blight of carrots, a bud rot of Washington palms apparently of fungus etiology, dodder on alfalfa, dry root rot of citrus possibly due to *Fusarium*, sclerotiniosis of lettuce, and *Graphiola* leaf spot of date palms.

[Studies in plant pathology by the Georgia Station]. (Partly coop. Ga. Coastal Plain Sta. and U. S. D. A.). (*Georgia Sta. Rpt. 1940*, pp. 16-20, 51-57, fig. 1).—Brief summaries of progress are included on studies of black rot of muscadine grapes; resistance of peppers to southern blight; peanut breeding

and selection for disease resistance and other desirable characters; sulfur dust for control of peanut leaf spots; the effects of peanut seed treatment on germination and yields; cold injury to peach trees; disease control on field-grown tomato plants; breeding and selection of watermelons for wilt resistance, and of snap beans, Austrian Winter peas, vetches, and lupines for resistance to various diseases; delinting and treating anthracnose-infested cottonseed; new nematode species (*Rotylenchulus reniformis* and two as yet unnamed) parasitic on cotton roots; relation of different nematode species to cotton wilt in Georgia; and effect of potash on yield and wilt of cotton in 1939.

[Plant disease work by the Rhode Island Station] (*Rhode Island Sta. Rpt.* [1939], pp. 22, 23, 24, 38-41, 42).—Brief reports are included on the incidence of diseases of grasses and of perennial and annual ornamental and crop plants, and on the first appearance of the "X"-virus disease of peach and choke-cherry and of the potato "sprain" disease in the State; studies on the bleeding canker (*Phytophthora cactorum*) of maple and beech and its control; varietal tests with eggplants yielding highly resistant strains; field tomato disease control work; field observations on apple scab; dieback of *Daphne cneorum* associated with fungi; potato spraying trials; soil fumigation with chloropicrin for tomatoes; factors in the killing of weed seeds and in turf injury by chloropicrin; and chemical soil treatments for root knot nematode control in greenhouse tomatoes.

[Plant diseases in the Philippines] (*Natl. Res. Council Philippines Bul.* 23 (1939), pp. 170, 176, 177, 179, 188, 189, 190, 192, 193, 194, 198, 199, 200, 201, 205, 206).—Abstracts are given of the following papers: A *Sclerotium* Stem Rot Disease of *Musa glauca* Roxb., by N. G. Teodoro; Damping-Off of Lettuce and Heart Rot of Petsai Caused by *Pythium aphanidermatum* (Edson) Fitz., by E. F. Roldan; Rootlet Rot of Avocado Seedlings, by E. F. Roldan and X. Raktanishita; Mosaic of Abacá, by G. O. Ocfemia and M. S. Celino; Some Plant Diseases of Economic Importance Not Previously Known in the Philippines, by F. M. Clara; The Rice Cadang-Cadang in Albay Province—I, Its Probable Cause, by F. de Peralta and J. A. Agati; Study on the Root Knot Nematode Affecting Strawberries in Bagnio, by T. G. Fajardo; "Palay Lalake," a Fungous Disease of Rice, by G. M. Reyes; The Bacterial Wilt of Abaca in Davao—A Progress Report, by M. A. Palo; A Comprehensive Study on Symptoms of Abaca Mosaic, by M. R. Calinisan; Further Studies on the Transmission of the Fiji Disease of Sugar Cane, by G. O. Ocfemia, M. S. Celino, and C. A. Calica; Progress in the Control of the Late Blight Disease (*Phytophthora infestans* Mont.) De Bary by Blight Resistant Potatoes, by T. G. Fajardo; and A New Gray Mould Found on Beans and Spineless Kulitis, by G. M. Reyes.

The symptoms and diagnosis of minor-element deficiencies in agricultural and horticultural crops.—I, Diagnostic methods: Boron, manganese, C. S. PIPER (*Empire Jour. Expt. Agr.*, 8 (1940), No. 30, pp. 85-96).—A critical review with 57 references.

"Potash hunger" is easiest identified on leaves of plants, R. COWART (*Miss. Farm Res. [Mississippi Sta.]*, 3 (1940), No. 8, p. 6).—The diagnostic value of leaf symptoms of potash deficiency are discussed briefly.

Preliminary host index to fungi of Mount Shasta, California, W. B. COOKE (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 1940, Sup. 123, pp. 125-133).

Action of some organic compounds on yield, sporulation, and starch formation of *Aspergillus niger*, R. A. STEINBERG. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 60 (1940), No. 11, pp. 765-773).—"The effects of 37 biological stains, 21 miscellaneous organic compounds, and 85 phenanthrene derivatives on

growth, sporulation, and starch formation of *A. niger* were studied at concentrations of 1, 10, 20, and 100 mg. per liter. An increase in yield above that of the control occurred only in a solution partially deficient in trace elements and was attributed to the presence of inorganic impurities in the organic compounds. Toxicity was greatest with malachite green (1 p. p. m.), though the hydroxyphenanthrenes (10 p. p. m.) were also quite toxic. Responses in yield, sporulation, and starch formation were not uniform, but were related to the chemical constitution of the compound. Starch formation was decreased by low nitrogen and by certain compounds. Low trace elements led to an increase in starch formation, as did also certain relatively toxic compounds."

Studies on *Caryospora putaminum*, W. F. JEFFERS. (Md. Expt. Sta.). (*Mycologia*, 32 (1940), No. 4, pp. 550-566, figs. 2).—A study of the life history, cultural characters, and taxonomy of *C. putaminum*, occurring chiefly on old peach stones, is presented, *C. minima* n. sp. is described, and an annotated list of previously described species of the genus is given.

The presence of *Fusarium scirpi* var. *acuminatum* in Argentina [trans. title], C. J. M. CARRERA (*Rev. Argentina Agron.*, 7 (1940), No. 2, pp. 89-94, figs. 3).—A fungus identified as *F. scirpi acuminatum* was found associated with a basal blight of carnation (*Dianthus caryophyllus*) and shown to be the cause. Since it had been demonstrated that this fungus is also pathogenic to flax, attention is called to the potential danger to this crop.

The effect of crop debris on the pathogenicity of cereal root-rotting fungi, L. E. TYNER (*Canad. Jour. Res.*, 18 (1940), No. 7, Sect. C, pp. 289-306, figs. 2).—The effect of wheat, barley, and oat straw composted with soil on the development of disease in the basal parts of wheat seedlings was studied during three seasons in greenhouse tests, the pathogens used being *Ophiobolus graminis*, *Helminthosporium sativum*, and *Fusarium culmorum*. Wheat straw composts proved distinctly more favorable to disease development than the others, while the least injury occurred with the oat straw. It is suggested that the micro-organisms associated with the decomposition of oat straw brought about some degree of biological control of the pathogens. Although the amount of straw applied sometimes influenced the severity of disease, the effects were not consistent from planting to planting. The actual C:N ratio had less effect on disease development than the chemical nature of the straw. The kind and amount of straw in the composts also influenced seedling vigor, which in general was inversely proportional to the degree of infection. A short fallow between plantings decreased infection somewhat and increased vigor. The pathogenicity of the artificial inoculum added at the first planting was practically vitiated before the second. Subsequent infection ratings tended to increase and were about the same as those in uninoculated series. There are 27 references.

Studies on the natural inoculation of seed barley with covered smut (*Ustilago hordei*), V. F. TAPKE. (U. S. D. A. and [N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 60 (1940), No. 12, pp. 787-810, pl. 1, figs. 5).—Investigating the mechanism of spontaneous inoculation and the methods of artificial inoculation of barley with spores of *U. hordei*, the author found that spontaneous infection resulted largely from spores germinating under the glumes. Spores from disintegrated smutted heads were disseminated in the field before the barley had matured and later during harvesting and threshing. High humidity favored infection in inoculated stored seed. These findings are believed to explain the failure frequently met with in attempting to inoculate barley by dusting dry spores on the outside of glumes. Preliminary studies seem to indicate that the variety of barley, the physiologic race of smut, and the conditions under which the plants

are grown are factors concerned in the different types of emergence of the smutted head, viz, fully exerted or remaining half enclosed in the boot. The recently extended knowledge of the factors conditioning barley infection with *U. hordei* has aided in developing the spore-suspension method of seed inoculation. This new artificial method, patterned after the spontaneous method, has proved highly and consistently effective as well as practicable. There are 53 references.

The effect of nutrient salts in organic mercurial seed disinfectants on the germination and early growth of wheat, N. H. GRACE (*Canad. Jour. Res.*, 18 (1940), No. 5, Sect. C, pp. 151-157).—"Wheat seed was treated by dusting with a series of seed disinfectants containing 5 percent of ethyl mercuric halide . . . and three concentrations of each of KNO_3 , KILPO_4 , NH_4KHPO_4 , and $\text{Ca}(\text{H}_2\text{PO}_4)_2 \cdot \text{H}_2\text{O}$. This method of applying nutrient salts failed to effect any general stimulation to germination or early growth. In one experiment with Marquis wheat, KNO_3 accelerated germination without increasing the final value, and all but KH_2PO_4 increased root weight 3 weeks after planting. In two subsequent experiments with only KNO_3 added to the mercurial but with four varieties of wheat, conducted at different temperatures, no stimulation was observed."

The use of water by wheat plants when inoculated with *Helminthosporium sativum*, B. J. SALLANS (*Canad. Jour. Res.*, 18 (1940), No. 5, Sect. C, pp. 178-198, figs. 4).—The transpirational histories of wheat plants inoculated with *H. sativum* to produce root rot exhibited a marked reduction in water loss during the early growth stages as compared with uninoculated plants. This was accompanied by a corresponding reduction in the transpiring areas owing to reduced lengths and widths in the second, third, and fourth leaves. In the early stages of elongation of the culm the transpirational story reflected a recovery in the inoculated plants. Later leaves to appear were longer and with greater transpiring areas than in control plants. This combined with the death of the first three or four leaves resulted in greater transpirational and photosynthetic areas in the inoculated plants with the consequent higher yields of dry matter. It is deemed probable that similar recovery does not occur under competitive field conditions where weeds and healthy wheat are also both present. Poor light conditions and low soil moistures did not prove conducive to recovery of inoculated plants. The water requirements of wheat did not appear to be affected significantly by inoculation. Of two spring wheat varieties, Reward was more severely injured initially and recovered more quickly than Marquis. Several possible explanations of the recovery recorded are discussed.

The relationship of weeds to losses caused by common rootrot in wheat, B. J. SALLANS (*Sci. Agr.*, 20 (1940), No. 11, pp. 632-637, fig. 1).—It was found that *Helminthosporium sativum*, a principal cause of common root rot of cereals in western Canada, may retard wheat in the seedling stage so that weeds become well established. The latter in turn may then prevent the normal tendency of the crop to recover, resulting in reduced grain yields.

A study of the transference of immunity to stem rust from *Triticum durum* var. Iumillo to *T. vulgare* by hybridization, R. F. PETERSON and R. M. LOVE (*Sci. Agr.*, 20 (1940), No. 11, pp. 608-623).—"A number of *T. vulgare* derivatives from *T. vulgare* \times *T. durum* var. Iumillo crosses have a degree of resistance to stem rust closely approximating the immunity of Iumillo. This resistance can be more readily transferred to other *vulgare* wheats by hybridization than can the immunity or resistance of Iumillo itself. In spite of the considerable amount of cytological irregularity found in the material studied, a number of lines, and particularly reselections from the lines, are relatively stable 42-chromosome wheats morphologically similar to standard *vulgare* types. The

effectiveness of intense selection is shown in that the rust reactions of the selected lines in the field were practically as stable as that of Iunillo. This was true notwithstanding the fact that many plants were aneuploids (having more or less than 42 chromosomes) or were heterozygous for the arrangement of one or more chromosome segments. The rigorous selection for stem rust immunity in the field had apparently eliminated all or most of the cytological irregularities involving the genes necessary for mature plant immunity. The practical value of cytological examination of hybrid derivatives in plant breeders' material is evident."

The influence of light and certain other environmental factors on the mature-plant resistance of Hope wheat to stem rust, T. JOHNSON and M. NEWTON (Canad. Jour. Res., 18 (1940), No. 8, Sect. C, pp. 357-371, figs. 2).—A 60 percent reduction in light intensity during the whole growing period tended to influence the reaction of Hope wheat plants to race 21 of *Puccinia graminis tritici* toward increased susceptibility and caused a modification in morphology toward a softer, less rigid plant and a higher moisture content. This shift toward susceptibility was, however, not very marked, and in only one test did the plant reaction approach complete susceptibility. Plants receiving 6 hr. of light daily were less resistant than those with 10 hr. of light, and these in turn were slightly less resistant than those receiving full daylight for the period of the experiment (February-June). Temperature tests indicated that 75°-80° F. constantly applied is capable of causing a partial or even complete break-down of mature-plant resistance in Hope wheat. Some evidence was secured that abundance of soil moisture and of mineral nutrients also diminished rust resistance.

A Great Northern bean resistant to curly-top and common bean-mosaic viruses, D. M. MURPHY. (Idaho Expt. Sta.). (Phytopathology, 30 (1940), No. 9, pp. 779-784, fig. 1).—Curly top and common bean mosaic are said to be two of the most important bean diseases in Idaho and to have caused severe losses to the bean-growing industry in the State. Three Great Northern selections by the station now represent almost the entire Great Northern crop in Idaho. For several years a program of continuous plant selection and testing for resistant selections in this group has been carried out. A new selection, Great Northern U. I. 15, proved to be the most valuable from several standpoints and has been increased as rapidly as possible on the trial grounds. It is this selection which has proved resistant to the viruses of both curly top and common bean mosaic. Its virus-resistant properties and some of its other outstanding characteristics, as well as the symptoms of the two diseases, are discussed.

Cotton wilt and root-knot nematode, D. C. NEAL. (U. S. D. A. et al.). (Better Crops With Plant Food, 24 (1940), No. 2, pp. 36, 37).—A note calling attention to the recent surveys showing many cotton-growing areas of the Gulf Coastal Plain heavily infested with *Fusarium vasinfectum* and *Heterodera maiioni* and the apparent breaking down of wilt resistance in special wilt-resistant cotton varieties when nematodes attack the plants. Rotations with nematode-resistant plants are recommended.

Methods of inoculating soil with the cotton wilt organism, H. B. TISDALE, and J. B. DICK (Alabama Sta. Rpt. 1938, p. 10).—Note on results of a 3-yr. study.

Soil sickness of flax in North Dakota, H. H. FLOER. (U. S. D. A. and N. Dak. Expt. Sta.). (Phytopathology, 30 (1940), No. 9, pp. 749-760, figs. 2).—Varieties of flax varying in degree of wilt resistance were sown on soil cropped to flax almost continuously for 45 yr. The progress of root infection as shown by development of fungi isolated from roots and hypocotyls dug at 2- or 3-day intervals was determined. No preemergence injury occurred in the field and

no fungi developed from flax roots until well after cotyledon emergence (7-11 days). The Bison (wilt-resistant) became infected with *Fusarium lini* as soon as Damont and Newland (wilt-susceptible) varieties. The preponderance of *F. lini* (425 isolates, compared with 15 of *Alternaria* spp., 16 of *Thielavia basicola*, and 4 of *Rhizoctonia* spp.), together with the fact that the earliest infection of all varieties was by *F. lini*, indicates that injury in these tests was primarily due to wilt. *Fusarium* infection of wilt-resistant varieties was local in contrast to the apparent systemic infection of wilt-susceptible varieties. In greenhouse pot tests, severe seedling injury resulted in both steamed and nonsteamed soil when flax was sown immediately after inoculation with *Rhizoctonia* spp., but injury diminished in successive monthly sowings. In nonsteamed farm soil no injury was apparent, even when flax was sown immediately after inoculation of the soil with *Pythium*.

Wilt of pimento (*Capsicum annum*) in the Province of Mendoza [trans. title], R. E. PONTIS (*Rev. Argentina Agron.*, 7 (1940), No. 2, pp. 113-127, pls. 2, fig. 1; *Eng. abs.*, p. 123).—The author describes the symptoms and the results of studies of the morbid anatomy, etiology, spread, and control of the disease, and factors influencing its development. The pathogen was identified as *Fusarium vasinfectum*. Other *Fusarium*s tested proved to be nonpathogenic to pepper. There are 39 references.

Resistance of certain potato varieties and seedling progenies to late blight in the tubers, R. BONDE, F. J. STEVENSON, and C. F. CLARK. (Maine Expt. Sta. and U. S. D. A.). (*Phytopathology*, 30 (1940), No. 9, pp. 733-743, figs. 4).—Seedlings of known parentage were tested for resistance to vine and tuber infection by *Phytophthora infestans* under field and laboratory conditions in Maine, a high percentage proving resistant to both types of infection when one or both parents were resistant. Resistance of the leaves, however, was not necessarily accompanied by resistance of the tubers. Seedlings with resistant tubers and foliage were secured by selfing the susceptible variety Katahdin, resistance in both cases apparently depending on morphological structure and on physiological properties. Tubers of some varieties were susceptible to late blight decay while immature but resistant when mature. The virulence of the pathogen had apparently not been increased by propagation on certain resistant varieties. Some potato varieties gave no evidence of loss of resistance to late blight infection after having been grown in Aroostook County for 10 yr.

Some evidence on the spread of bacterial wilt, C. H. MERZGER and A. M. BINKLEY. (Colo. State Col.). (*Amer. Potato Jour.*, 17 (1940), No. 8, pp. 198-201).—Data taken from two fields of Katahdin potatoes under irrigation gave indications of spread of the disease in the field. A larger number of plants became infected down the row below a plant showing symptoms than up the row above it. Considerable evidence of spread was found in the rows above the plants showing symptoms and in the first and second rows on either side. It is concluded that while irrigation water seems to play some part in dissemination, spread in other directions could not be accounted for on this basis. Since the most prevalent insect was the flea beetle, it is suspected as the most logical agent of spread.

Report on potato virus diseases in 1939, T. P. DYKSTRA. (U. S. D. A.). (*Amer. Potato Jour.*, 17 (1940), No. 8, pp. 201-210).—A continuation of the series of annual reviews of international literature by this author (*El. S. R.*, 82, p. 638). There are 22 references.

Verticillium wilt of the sugar beet, J. O. GASKILL and W. A. KREUTZER. (U. S. D. A. and Colo. State Col.). (*Phytopathology*, 30 (1940), No. 9, pp. 769-774, figs. 3).—"In the latter part of August 1939 an unusual wilt of the

sugar beet (*Beta vulgaris* L.) was observed in fields in the vicinity of Ault, Colo. Isolations from the necrotic vascular tissues of the roots of affected plants yielded a species of *Verticillium* which was capable of inducing symptoms characteristic of the disease. The morphology of the causal organism resembled closely the description of *V. albo-atrum*. Eleven fields were examined in 5 agricultural districts in northern Colorado, and *Verticillium* wilt was found in 7 fields representing 3 districts. In paired comparisons of diseased and apparently unaffected roots at harvest, the former class was found to be significantly lower in average percentage of sucrose, coefficient of apparent purity, and gross and indicated available sucrose per root. The average weight of diseased roots was also lower than that of the controls, but the difference was not significant."

Studies on the transmission of sugar-beet yellows virus by the aphid, *Myzus persicae* (Sulz.), M. A. WATSON (*Roy. Soc. [London], Proc., Ser. B*, 128 (1940), No. 853, pp. 535-552).—The efficiency of *M. persicae* in transmitting this virus increased greatly with lengthening of feeding time on infected plants, infection following on a succession of healthy plants for 1, 2, and 3 days, depending on the length of the infection feeding. The infectivity of the vectors increased with length of feeding on healthy plants undergoing infection and decreased with length of feeding time on healthy plants prior to those used for the infection trial. There was no clearly defined "incubation period" of the virus in the vector below which no insect could induce infection, but there was variation in the time between cessation of infection feeding and initiation of infection in healthy plants. The virus-vector relation is said to differ from that of viruses described as "nonpersistent." For the latter, infectivity is lost by *M. persicae* soon after cessation of infection feeding. After fasting the vectors become optimally infective almost immediately on penetrating infected leaf tissues. Their infectivity decreases with lengthened feeding time on infected plants and increases only slightly with lengthened feeding time on healthy plants. The behavior of sugar beet yellows virus is compared to that of curly top, in which infectivity also persists for an indefinite period in the vector and increases with lengthened feeding time on infected and healthy plants.

White necrosis—a virus disease of *Nicotiana tabacum* and *N. sylvestris*, with delayed symptoms [trans title], A. S. COSTA, A. R. LIMA, and R. FORSTES (*Jor. Agron.*, 3 (1940), No. 1, pp. 1-26, pls. 10; *Eng. abs.*, pp. 22, 23).—The new virus disease of tobacco described was found spontaneously in *N. tabacum* and *N. sylvestris*. It was transmitted by grafting or rubbing to *N. glutinosa*, *N. rustica*, *N. alata*, *N. repanda*, *N. langsdorffii*, *N. longiflora*, *Solanum nodiflorum*, and *Nicandra physalodes*. The virus is said to induce three successive stages in the pathological picture, viz, white necrosis, apparent recovery, and a "cabbage-leaved" stage—described in detail. The virus properties are discussed, and it is believed closely related to the tobacco streak virus.

Wilt resistance of the Riverside variety of tomato to both *Fusarium* and *Verticillium* wilts, M. SHAPOVALOV and J. W. LESLEY. (*Calif. Citrus Expt. Sta. coop. U. S. D. A.*). (*Phytopathology*, 30 (1940), No. 9, pp. 760-768, fig. 1).—The Riverside tomato, developed cooperatively, proved highly resistant to *Verticillium* and *Fusarium* wilts under the test conditions employed. When attacked by both fungi the *Fusarium* infection appeared to be much less frequent than the *Verticillium*. In cultures from stems of diseased plants, *Fusarium* usually predominated in the hotter part of the season, but *Verticillium* gained the ascendancy in the cooler fall weather. Not infrequently *Fusarium* was superseded by *Verticillium* in the same plant with onset of

cooler weather. Riverside is said to be suitable for both shipping and canning and is adapted to localities with a long growing season. As a late shipping variety, it is especially promising because of its shape, firmness, late maturity, and relative freedom from radial stem-end cracks.

Root injury and recovery, A. J. HEINICKE (*Mass. Fruit Growers' Assoc. Rpt.*, 45 (1939), pp. 84-95).—An address discussing the general aspects of the question, with special reference to orchard fruit trees.

Root responses of noninfectious hairy root apple seedlings under different methods of propagation, E. A. SINGLER and J. J. BOWMAN. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 60 (1940), No. 11, pp. 739-754, figs. 5).—Experiments have confirmed field observations that seed of many commercial varieties of apples produced relatively high percentages of progeny exhibiting a disorder, probably genetic, characterized by excessive numbers of small lateral roots at the collar. It is proposed to call this disorder "noninfectious hairy root." Experiments, mainly with root cuttings and grafts, proved that by varying the growth conditions stem rooting could be either induced or prevented. By inducing stem rooting, the symptoms were suppressed; by precluding stem rooting, symptoms were made manifest. It is advised that no parts of affected seedlings be used for ordinary propagative purposes. It is further suggested that affected seedlings might readily furnish sources for dwarfing rootstocks.

Eradicant treatments to aid in the control of apple scab, D. H. PALMITER and J. M. HAMILTON. (N. Y. State Expt. Sta.). (*N. Y. State Hort. Soc. Proc.*, 85 (1940), pp. 306-309).—This progress report points to the possibility of reducing the danger in orchards with a heavy carry-over of scab to such an extent that a light schedule of wettable sulfurs may be used with comparative safety. The only effective treatments are made before any spores can be discharged to start infection.

Boron deficiency and internal cork of apples, A. B. BURRELL. (Cornell Univ.). (*N. Y. State Hort. Soc. Proc.*, 85 (1940), pp. 84-89).—This is a general discussion of the disease and a progress report on several years' experiments, with recommendations for commercial use of boric acid or borax in control.

Apple spray injury, C. F. TAYLOR (*W. Va. Univ. Bul.*, 40. ser., No. 5-1 (1939), pp. 36-43).—A review, with 40 references.

The "X" disease, or yellow-red virosis, of peach, E. A. WALKER. (Univ. Md.). (*Md. Agr. Soc., Farm Bur. Fed., Rpt.*, 24 (1939), pp. 154-156).—A general review of this disease on peach and chokecherry, with field observations by the author.

Protecting peach orchards from yellow-red viruses (X-disease), D. H. PALMITER and E. M. HILDEBRAND. (N. Y. State Expt. Sta. and Cornell Univ.). (*N. Y. State Hort. Soc. Proc.*, 85 (1940), pp. 183-186).—A general discussion of the present status of knowledge on the disease, with recommended procedures for eradicating the wild host chokecherry.

New developments in the control of diseases of small fruits, R. F. SUIT. (N. Y. State Expt. Sta.). (*N. Y. State Hort. Soc. Proc.*, 85 (1940), pp. 262-269).—A summary of recent work with spur blight of red raspberries, raspberry mosaic, gooseberry powdery mildew, and leaf spots of gooseberry and currant.

Density of stomata and oil glands and incidence of water spot in the rind of Washington Navel orange, F. M. TURRELL and L. J. KLOTZ. (Calif. Citrus Expt. Sta.). (*Bot. Gaz.*, 101 (1940), No. 4, pp. 862-871, figs. 9).—The mean stomatal density for fruits of this variety was 13.86 per square millimeter, and it was greater for small than for large oranges. The mean density of oil glands was 2.33 per square millimeter, and they also were more densely dis-

tributed in small than in large fruits. The density of neither stomata nor oil glands proved to be related to water-spot incidence. The radial arrangement of stomata in narrow circular zones about oil glands, as reported by others for citrus leaves, was also found in the fruit rind of the Washington Navel orange.

The "wound" or "pruning" disease of the coffee tree [trans. title], F. CHOUSSY (*Café El Salvador*, 10 (1940), No. 112, pp. 312-315, figs. 2).—A brief note on studies of a disease ascribed to a fungus of the *Rostrella* group or possibly to a *Fusarium*.

Experiments on the control of mango anthracnose by spraying, R. K. McKEE (*Trop. Agr. [Trinidad]*, 17 (1940), No. 6, pp. 115-117).—A spraying trial for the control of mango anthracnose which was carried out for 3 yr. is described. Results show that good control is obtained by spraying with a 1 percent Burgundy mixture. Spray schedules are discussed. It is suggested that spraying in any one year continues to give a beneficial effect in the next year." The disease is due to *Colletotrichum gloeosporioides*.

Bacterial blight of filberts and its control, P. W. MILLER (*Oreg. Agr. Col. Ext. Bul.* 532 (1939), pp. 8, figs. 9).—An informational leaflet on the nature and course of the disease, due to *Phytomonas* sp., and on its control.

The pathogen of filbert bacteriosis compared with *Phytomonas juglandis*, the cause of walnut blight, P. W. MILLER, W. B. BOLLEN, J. E. SIMMONS, H. N. GROSS, and H. P. BARSS. (*Oreg. Expt. Sta. coop. U. S. D. A.*). (*Phytopathology*, 30 (1940), No. 9, pp. 713-733, figs. 5).—Comparing a considerable number of isolates of the filbert blight pathogen and of *P. juglandis*, the cause of walnut bacteriosis, essentially no differences in morphology, staining reactions, cultural characters, or biochemical characteristics were found. No differences were found between the pathogens in regard to carbon sources utilized. Differences appeared in the rate of utilization of certain carbon sources by different isolates, but these were fortuitously distributed among all isolates of both pathogens and were thus of no differential value. Both pathogens utilized the same nitrogen sources. Variations in rate of utilization of nitrogen sources by different isolates were less pronounced than variations in rate of utilization of carbon sources. However, the results of preliminary cross-agglutination studies suggested that the filbert-blight pathogen may be serologically separated from *P. juglandis*. Distinct differences in pathogenic behavior between the two pathogens were also demonstrated. In field cross-inoculation studies all isolates from walnut were negative or practically so on filbert branches, whereas all filbert isolates were negative on walnut stems of current growth. On the basis of these pathological and serological differences, it is proposed to designate the filbert-blight organism *P. corylina* n. sp.

A flower-spot disease of cultivated azaleas, F. WEISS and F. F. SMITH (*U. S. Dept. Agr. Cir.* 556 (1940), pp. 28, figs. 14).—The symptoms are described of a destructive disease, unknown prior to 1931, attacking flowers of cultivated azaleas, especially of the Indian and Kurume types. The disease occurs in all the Southeastern and Gulf States from Wilmington, N. C. to Houston, Tex., and has been found in most of the prominent city and town plantings of azaleas in the Coastal Plain. Infected flowers tend to cling to the twigs, producing an extremely unsightly appearance. Under favorable conditions the disease may spread so rapidly as to destroy practically all the flowers of an extensive azalea planting within a few days. The causal fungus (*Oculinia azaleae*) (E. S. R., 83, p. 80) produces sclerotia in the blighted flowers which overwinter in the soil. From them fruiting bodies develop in the spring during the early part of the flowering season; they bear spores which may infect only relatively

few flowers, but secondary spores are produced in large numbers on the initial infections. The latter are responsible for widespread and destructive outbreaks of flower spot.

Air currents and rain are the principal dispersal agents from flower to flower or among closely planted bushes, but flower-visiting insects, especially bumblebees of several species, are important carriers of spores to greater distances. The disease may be spread in this way to distances of 1 to several miles. In the secondary spore stage the fungus may be transported on blooming azaleas and as sclerotia in the surface litter and soil beneath dormant plants. When dormant plants are cleaned of surface litter and soil, as in balling them for transplanting, dissemination of the fungus appears to be prevented. The first step in control is to reduce the sclerotial survival to a minimum by destroying infected flowers before and after flower fall, and by removing the surface soil from around infected plants after flower fall and replacing it with new earth or a thick leaf mulch. Control of secondary spread by sprays or dusts applied to the flowers has not proved practicable without first reducing primary infections from overwintering sclerotia to the lowest possible minimum. Copper and acetic acid sprays and soil drenches, and copper-clay dust have shown promise of control under conditions of minimal primary infection and when their application is begun with the first appearance of colored buds.

Root knot of peony, P. E. TILFORD (*Ohio Sta. Bmo. Bul.* 205 (1940), pp. 132-134, fig. 1).—The experimental evidence presented indicates that *Heterodera marioni* is not a serious pest to peonies in the locality of Wooster, provided the plants are growing in a rich, heavy soil. In Ohio it is seldom possible to attribute poor growth of peonies in gardens to nematodes, but the stock in many nurseries is affected. When the roots are sold to gardeners, the knots or galls are cut off. It is impossible to eliminate all the nematodes this way, but the roots usually produce satisfactory plants when set in rich garden soils. It was evident that hot water treatments will reduce the nematodes in peony roots, but treatments that are noninjurious to the roots do not completely free them of living nematodes.

An undescribed fungus on Japanese cherry, E. S. LUTTRELL (*Mycologia*, 32 (1940), No. 4, pp. 530-536, figs. 9).—The author studied the development of a fungus infecting the twigs of *Prunus serrulata* near Durham, N. C., describing it as *Catenophora pruni* n. gen. and sp., in the Melanconiaceae.

Tree therapeutics, E. G. REX (*Natl. Shade Tree Conf. Proc.*, 15 (1939), pp. 4-11).—A general discussion of the control of systemic diseases of trees, especially maples and elms, with an analysis of the problems of the pathologist with respect to tree diseases.

Virus diseases of forest and shade trees, R. K. BEATTIE (U. S. D. A.). (*Natl. Shade Tree Conf. Proc.*, 15 (1939), pp. 12-21, figs. 3).—General considerations, including pertinent data on spike disease of sandal, witches'-broom of locust, and phloem necrosis of elm, are presented.

Sphaeropsis canker and dieback of shade trees, R. P. MARSHALL. (U. S. D. A. et al.). (*Natl. Shade Tree Conf. Proc.*, 15 (1939), pp. 65-69).—The author reviews the genus *Sphaeropsis* and the four species *malorum*, *ulmicola*, *quercina*, and *ellisi*, common causes of canker and dieback on shade trees. They are said to be controllable by sanitation and improved tree vigor, such procedures in large trees being facilitated by technical practices, especially climbing and improved methods of fertilizing developed by commercial workers.

Two diseases of *Gleditsia* caused by a species of *Thyronectria*, E. V. SHELLEY, JR. (*Jour. Arnold Arboretum*, 21 (1940), No. 3, pp. 405-427, pls. 4).—Two tree diseases were found to be due to the American fungus *T. austro-americana*

n. comb., one a wilt of *G. japonica* and the other a canker of *G. triacanthos*. The speedy killing of trees of *G. japonica* leads to the belief that were the fungus introduced to Japan, where it is not native, it might cause the decimation of this tree there. Collections of the fungus have indicated its distribution from Nebraska to Massachusetts and southward to the Gulf States. Therefore, it is to be expected that the canker disease will be reported elsewhere, now that it has been recognized. The symptoms of the two diseases, successful inoculation tests, and the cultural characters and life history of the causal fungus are reported upon in detail. There are 19 references.

Ustulina vulgaris decay in sugar maple and other hardwoods, W. A. CAMPBELL and R. W. DAVIDSON. (U. S. D. A. et al.). (*Jour. Forestry*, 38 (1940), No. 6, pp. 474-477, fig. 1).—During the summer of 1938, a number of sugar maple (*Acer saccharum*) sprouts over 50 yr. old on the Green Mountain National Forest, Vt., were dissected for butt rot as a guide to treating sprout maples during stand improvement. Among the associated fungi was an ascomycete, *U. vulgaris*, which was also common on beech (*Fagus grandifolia*) and red maple (*A. rubrum*). This apparent prevalence of *U. vulgaris*, together with previous reports of its parasitism on other hosts, made desirable a detailed analysis of its occurrence on sugar maple.

Studies on the ink-spot disease of poplar, R. POMERLEAU (*Canad. Jour. Res.*, 18 (1940), No. 5, Sect. C, pp. 199-214, pl. 1, figs. 3).—This leaf disease, due to *Sclerotinia difrons* (E. S. R., 82, p. 789) was studied during a severe outbreak (1935-37). The fungus was found to hibernate on the ground in the sclerotial stage, and during spring the apothecia are produced thereon. Leaf infection is induced by ascospores ejected from the apothecia, and after 2-3 weeks of incubation reddish areas appear on the leaves. New sclerotia are formed in the lesions in June and are ready to fall about July 15. Epidemic development of the disease is favored by a fairly large number of sclerotia on the ground, the occurrence of a dense stand of young poplars, and low temperature and high humidity before and at the time of foliation. During an outbreak a considerable number of trees in the sapling stage are killed and others are affected by an intense defoliation. These effects are noticeable only in thickets of pure population of aspen, which usually represent the first stage of natural reforestation in Quebec.

A preliminary report on a fungus disease of the field bindweed, Convolvulus arvensis, W. M. BEVER and C. I. SEELY. (Idaho Expt. Sta. coop. U. S. D. A. (*Phytopathology*, 30 (1940), No. 9, pp. 774-779 figs. 3).—A fungus attacking *C. arvensis* was observed in the Palouse area of Idaho and Washington, particularly on northern slopes. Successful inoculations and reisolutions have been made. Field symptoms of the disease are characterized by initial infections appearing in or towards the center of a bindweed patch and spreading more or less in all directions with the spread of the weed. Infected individuals gradually die out so that the centers of the patches eventually become bare and surrounded by a ring of healthy, green plants, giving the entire patch a "doughnut" appearance. Lesions appear on any point of the stem that may be in close proximity to the soil. Plants repeatedly killed back become very weak and appear as though suffering from depleted carbohydrate reserves. Under greenhouse conditions on artificially inoculated seedlings, the lesions are formed at the crown. The attacked plants eventually wilt and occasionally the leaves turn yellow before actual death of the plant. The fungus has been tentatively identified as *Rhabdospora* sp. Evidence indicates the fungus to be soil-borne.

Opuscula miscellanea nematologica, VI–VIII, G. STEINER. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 4 (1937), No. 2, pp. 48–52, figs. 2; 5 (1938), No. 1, pp. 35–40, figs. 3; 7 (1940), No. 1, pp. 54–62, figs. 5).—Continuing this series (E. S. R., 77, p. 808), the following are included:

In part 6 the author discusses the status of the nematode *Aphelenchoides coffeae* n. comb. (= *Aphelenchus coffeae*); the occurrence of the bud and leaf nematode *Aphelenchoides fragariae* on the peony and oriental poppy in the United States; and notes on *Eucephalobus teres* observed on a narcissus bulb in Virginia, including a more complete description of the species.

Part 7 comprises (1) observations on nematodes associated with Irish potatoes grown in South Carolina, including, among others, *Zeldia odontoccephala* n. sp., and *Acrobeloides enoplus* n. sp.; (2) on *Oriconemoides sphaerocephalum* A. L. Taylor, 1936, living on cotton roots in the United States; and (3) on sporozoan parasites of nematodes, reporting some observations made on the material discussed in (1).

In part 8 the possible harmful effect of soil-nematode invasions on cuttings to be rooted is noted, with examples; *Chiloplacus trilineatus* n. sp. from diseased snapdragon cuttings and a new grass nematode *Anguina australis* n. sp. are described; and notes are given on measurements and morphology of *Aphelenchoides limberti*, discovered in 1938 on a dahlia tuber from Germany and in 1939 in elm roots from California.

Plant-parasitic and free-living nematodes in Hawaii, J. M. OLIVEIRA. (Hawaii Pineapple Prod. Expt. Sta.). (*Bernice P. Bishop Mus. Occas. Papers*, 15 (1940), No. 29, pp. 361–373).—Approximately 84 species in 60 genera are listed, with 54 literature citations.

ECONOMIC ZOOLOGY—ENTOMOLOGY

The status of wildlife in the United States, K. PITTMAN ET AL. (U. S. Senate, 76 Cong., 3. Sess., Rpt. 1203 (1940), pp. [2] + 457, pls. 74, figs. 8).—The first and main part of this volume consists of a report by the Special Committee on the Conservation of Wildlife Resources, which includes a list of publications of the U. S. D. A. Bureau of Biological Survey, and of other publications relating to the subject. Appended to the committee's wildlife report are special reports relating to the subject from the U. S. Bureau of Fisheries (pp. 241–245), U. S. D. A. Forest Service by H. L. Shantz and J. H. Hatton (pp. 247–346), U. S. National Park Service by V. H. Cahalane, C. C. Presnall, and D. B. Beard (pp. 347–380), U. S. D. A. Soil Conservation Service (pp. 381–399), Civilian Conservation Corps by J. J. McEntee (pp. 401–407), U. S. Bureau of Reclamation by J. C. Page (pp. 409–417), Office of Indian Affairs by J. Herrick (pp. 419–423), U. S. Grazing Service by R. H. Rutledge (pp. 425–436), U. S. D. A. Agricultural Adjustment Administration by R. M. Evans (pp. 437–441), and U. S. D. A. Bureau of Agricultural Economics, Land Classification Section, by W. M. Rudolph (pp. 443–446).

Insects of the forest floor available as food for game animals, W. M. KULASH. (Mass. State Col.). (*Jour. Forestry*, 38 (1940), No. 7, pp. 554–557).—Field work conducted by the author in conjunction with a wildlife and timber management study in Massachusetts has shown the forest floor to be a suitable environment for many species of insects and spiders, some of which serve as food for game animals.

American mammals: Their lives, habits, and economic relations, W. J. HAMILTON, JR. (New York and London: McGraw-Hill Book Co., 1939, pp. XII + 434, figs. [93]).—This volume, dealing with North American mammals, is presented in 18 chapters, each of which includes a bibliography.

The land mammals of Nova Scotia, R. W. SMITH (*Amer. Midland Nat.*, 24 (1940), No. 1, pp. 213-241, fig. 1).—Presented with a list of 45 references to the literature.

Effect of ditching for mosquito control on the muskrat population of a Delaware tidewater marsh, L. A. STEARNS, D. MACCREARY, and F. C. DAIGH (*Delaware Sta. Bul.* 225 (1940), pp. 55, figs 24).—Following an introduction and brief discussion of mosquito control work in Delaware, the importance of the muskrat industry in the State, the selection and a description of the experimental marsh area, experimental procedure, and the effect of ditching in 1936-38 on (1) mosquito breeding, (2) height of water table, (3) character of vegetative cover, and (4) distribution of muskrat population are dealt with, and the continuance of the investigation is considered. Initiated by the station in 1932 at the request of resort interests, some 2,199 miles of ditches have been dug on an area estimated at 44,468 acres. This amounts to 44.7 percent of such land in the State and represents about 65 percent of the marshes which are serious mosquito-breeding areas. Much of the marshland bordering the Delaware River and Bay is adapted by nature to support a sizeable muskrat population, and for years a large proportion of the cash income of farmers in that part of the State has been derived from the sale of muskrat hides and meat. The total annual catch in the State approximates 150,000 hides, of which about 61 percent is derived from New Castle County, 14 percent from Kent County, and 25 percent from Sussex County. The total annual income to Delaware trappers from the sale of hides has ranged from as low as approximately \$50,000 to as high as approximately \$500,000. The average for the 20-yr. period, season of 1919-20 to that of 1938-39, inclusive, was slightly over \$200,000.

During the years 1936-39, inclusive, the effect of ditching for mosquito control upon muskrat life was determined by population and other studies on drained and undrained marsh, the experimental area comprising approximately 23 acres. "The recorded data show very definitely that when a muskrat marsh, such as this, is effectively ditched for mosquito control there is a rapid lowering of the water table, which within a short time is sufficient to effect a radical change in the existing vegetation. The plants, particularly *Scirpus olneyi* and *Spartina cynosuroides*, upon which the muskrats feed and which are utilized by them in house construction are soon replaced by others (*Hibiscus oculiflorus*, *Kosteletzkya virginica*, *Solidago sempervirens*, *Bidens trichosperma* var. *tenuiloba* and *Aster novi-belgii*) practically worthless for such purposes. This results in migration of muskrats from areas so treated to those which meet better their water and plant requirements. Observations over a period of years (1932-1939) indicate that productive muskrat marshes in Delaware are, generally speaking, relatively unimportant from the standpoint of mosquito breeding. Nevertheless, when such marshes are so located that mosquitoes originating therein cause appreciable discomfort in, and retard the development of, resort and other communities and when this consideration obviously more than offsets that of the income derived locally from the muskrat industry, such areas should be brought under control by ditching or other means. The marshlands of New Castle County from Delaware City to Smyrna are particularly valuable, however, with respect to muskrattng. Furthermore, while the mosquitoes produced therein undoubtedly cause considerable annoyance to the scattered rural population throughout that section, trap records show that there is little or no migration to the towns located to the west. On the contrary, flight data emphasize a substantial eastward movement correlated with prevailing winds from the southwest during the months [of] May to September, inclusive. Control operations in that part of the State are certainly unwarranted except in the case of possible limited areas of heavy breeding.

"Although the results of the experimental work treated in this bulletin permit but one conclusion, namely, that effective ditching of a productive muskrat marsh for mosquito control is definitely injurious, no attempt is made to generalize on the basis of the recorded data."

Life history and ecology of the white-throated wood rat (*Neotoma albigula albigula* Hartley) in relation to grazing in Arizona, C. T. VORHIES and W. P. TAYLOR (*Arizona Sta. Tech. Bul. 86 (1940), pp. [2]+453-529, figs. 15*).—Active investigations of the ecology and economic status of *N. albigula albigula*, conducted, because of its abundance on great areas of grazing range in Arizona, by both authors working together and separately from 1932 to 1935, inclusive, and by Vorhies alone from 1935 to 1938, inclusive, are reported. The field work was carried out chiefly in southern Arizona, centering on the Santa Rita Experimental Range of more than 50,000 acres about 35 miles south of Tucson, with some comparative studies on the Jornada Experimental Range in southern New Mexico. Collections and observations were made by Taylor in southern California and Texas and by Vorhies in northern Arizona on the Kaibab Plateau and in the Chuska Mountains. This subspecies ranges from near sea level to an altitude of about 8,200 ft. Analyses of 360 stomachs (30 per month for a year) show that cactus constitutes 44.17 percent of all its food and mesquite 29.8 percent. Grass furnishes but 4.79 percent of the total food and is not a principal item at any time, and animal matter, chiefly insects in great variety, furnishes only 0.28 percent. Quantities of succulents (cactus, etc.) eaten may amount to from 25 to 43 percent of body weight of the wood rat in a 24-hr. period, but dry weight food consumption is on the order of 5 percent of body weight. It stores food but in a somewhat erratic manner. Stores may be negligible in quantity or large in amount.

"The population of [*N. albigula*] *albigula* on the Santa Rita Range is estimated at 4.78 per acre or a total of 242,862. No definite fluctuations in numbers have been noted. Economically, the wood rat may be rated as (1) harmful, in consuming grass, as a nuisance about habitations, damaging range forage or cultivated plants, disseminating cactus, and harboring blood-sucking insects; (2) neutral, in food habits, its principal foods being not only abundant but even overabundant on some ranges; or (3) beneficial, as an aid to planting, in aeration and fertilization of the soil, as a food supply for man and valuable fur animals, or as a pet. Increase of the white-throated wood rat appears to be an effect rather than a cause of overgrazing—an 'animal weed.' Its principal foods are the cactus and mesquite which ranchmen are actually being paid to remove in some areas; hence, it cannot consistently be rated as injurious. Large-scale control is not needed and is undesirable. Local control, to eliminate the nuisance about habitations and get rid of assassin bugs, is a simple matter of a few snap traps."

A list of 32 references to the literature is included.

Observations on the incidence of some nematode parasites of the common rabbit (*Oryctolagus cuniculus*), W. M. R. EVANS (*Parasitology, 32 (1940), No. 1, pp. 67-77, figs. 5*).—Examinations made during the period November 1936 to February 1937 of 80 rabbits and from August 1937 to July 1938 of 446 additional rabbits for the presence of nematodes resulted in the finding of *Graphidium strigosum*, *Passalurus ambiguus*, and *Trichostrongylus retortaeformis*. The incidence of these nematodes is reported and their seasonal incidence discussed, with special reference to its ecological implication. "Evidence of host and age resistance is also demonstrated in infections with *G. strigosum*, *P. ambiguus*, and *T. retortaeformis*. The proportion of the sexes in *G. strigosum* was found to be constant during both periods. The percentage of males in

1936-37 was 45.6 and 45.96 in 1937-38. In *P. ambiguus*, however, the proportion of the sexes varied to a large extent."

Observations upon some common cestode parasites of the wild rabbit (*Oryctolagus cuniculus*), W. M. R. EVANS (*Parasitology*, 32 (1940), No. 1, pp. 78-90, figs. 6).—Examination of 96 and 446 rabbits, respectively, during the period indicated in the work above noted for cestode parasites, the rabbits being taken from the same area, resulted in the finding of the following species: *Otitotaenia denticulata*, *C. pectinata*, *Coenurus serialis*, *Cysticercus pisiformis*, and two species of *Hymenolepis*. The span of life of both *Otitotaenia pectinata* and *C. denticulata* is found to be not greater than 10 mo., and evidence is given to show that the intermediate host of *C. denticulata* is available between April and December and that of *C. pectinata* from August to April.

Life histories of North American cuckoos, goatsuckers, hummingbirds, and their allies: Orders Psittaciformes, Cuculiformes, Trogoniformes, Coraciiformes, Caprimulgiformes, and Micropodiiformes, A. C. BENT (*U. S. Natl. Mus. Bul.* 176 (1940), pp. VIII+506, pls. 73).—This is the thirteenth in a series of bulletins (E. S. R., 81, p. 805) on the life histories of North American birds, in the preparation of which many workers, recognized in the introduction, have contributed material.

Starling attacks upon warble-infested cattle in the Great Plains area, A. L. GOODRICH, JR. (Kans. State Col.). (*Jour. Kans. Ent. Soc.*, 13 (1940), No. 2, pp. 33-40).—This contribution, with its list of 22 references to the literature, is said to have been prepared in an effort to present a record of the attacks of starlings upon cattle, of which only incomplete accounts have been published.

An annotated list of the arthropods found in the burrows of the Florida gopher tortoise (*Gopherus polyphemus* (Daudin)), F. N. YOUNG and C. C. GORFF. (*Fla. Expt. Sta.*). (*Fla. Ent.*, 22 (1939), No. 4, pp. 53-62).

On some worms of the genera *Trichostrongylus* Looss, 1905, and *Cooperia* Ransom, 1907, in South India, M. A. NARAYAN RAO (*Indian Vet. Jour.*, 16 (1940), No. 5, pp. 306-311, pls. 2, figs. 10).

[Work in economic zoology and entomology by the Alabama Station] (*Alabama Sta. Rpt.* 1938, pp. 8, 9, 26-29).—The work of the year briefly reported upon (E. S. R., 81, p. 65) includes the tarnished plant bug and the pea aphid as factors in reducing seed yields of vetches, by H. R. Albrecht; the vegetable weevil, by J. M. Robinson; the relative efficiency of rotenone-containing insecticides in the control of vegetable insects, by F. S. Arant; control of citrus insects with oil emulsions, by L. L. English; fish production in farm ponds, by H. S. Swingle and E. V. Smith; and food crops for game birds, by A. M. Pearson.

[Work in economic zoology and entomology by the Arizona Station] (*Arizona Sta. Rpt.* 1939, pp. 63, 66).—The work of the year (E. S. R., 82, p. 216) briefly referred to includes a study of the seasonal utilization and forage requirements of range vegetation by rodents; and the aphid *Monellia costalis* affecting the pecan.

[Economic insects and rodents of the orchard and their control] (*Conn. Pomol. Soc. Proc.*, 48 (1938), pp. 81-92, 174-186, figs. 5).—Contributions relating to insect and rodent pests of the orchard and their control presented at Hartford, Conn., in December 1938 include the following: Important Insects of the Apple Orchard and Methods of Control, by P. Garman (pp. 81-87) (Conn. [New Haven] Expt. Sta.); and The Relation of Parasites to the Control of the Oriental Fruit Moth, by H. W. Allen (pp. 88-92), and Report on Rodent Control Work in Connecticut—Mouse Investigation and Control, by R. Isaac and H. Merrill (pp. 174-186) (both U. S. D. A.).

[Contributions on rodent and insect control in the orchard] (*Md. State Hort. Soc. Proc.*, 42 (1940), pp. 16-35).—Contributions presented at Hagerstown, Md., in January 1940 include A More Effective Method of Orchard Mouse Control, by H. J. Spencer (pp. 16-18); Should We Use Dinitro or Tar Oil for Dormant Spray? by W. S. Hough (pp. 18-21) (Va. Expt. Sta.); and Résumé of New Developments in Japanese Beetle Retardation Work in Maryland for 1939, by G. S. Langford (pp. 22-27), and The Codling Moth Situation, by E. N. Cory, H. S. McConnell, and C. Graham (pp. 27-35) (both Univ. Md.).

An introduction to entomology, J. H. COMSTOCK (*Ithaca, N. Y.: Comstock Pub. Co.*, 1940, 9. ed., rev., pp. XIX+1064, pl. 1, figs. 1228).—A revised edition of this work (E. S. R., 77, p. 810) which includes a 20-page list of references.

The microbiology of insects, with special reference to the biologic relationships between bacteria and insects, E. A. STEINHAUS. (Ohio State Univ.). (*Bact. Rev.*, 4 (1940), No. 1, pp. 17-57).—This review, under the headings of extracellular flora of insects, role of micro-organisms in insect nutrition, intracellular flora of insects, and other biologic relationships between micro-organisms and insects, is presented with a 10-page list of references to the literature.

Insect biochemistry, R. CRAIG and W. M. HOSKINS. (Univ. Calif.). (In *Annual Review of Biochemistry*, IX, edited by J. M. LUCK and J. H. C. SMITH. Stanford University, Calif.: Ann. Rev., Inc., 1940, vol. 9, pp. 617-640).—This review is presented with a list of 117 references to the literature cited.

Entomological systematics examined as a practical problem, J. SMART (In *The New Systematics*, edited by J. HUXLEY. Oxford: Clarendon Press, 1940, pp. 475-492).

Supplementary list of common names of insects approved by the American Association of Economic Entomologists (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 708, 709).—A list is given of the common names and of the scientific names of 32 insects to be added to those previously adopted (E. S. R., 82, p. 70).

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 646, 647, 647-649, 699-705, figs. 3).—The contributions presented (E. S. R., 83, p. 652) are: Effect of Wheat Harvesting Machinery on Insect Control, by T. H. Parks (pp. 646, 647) (Ohio State Univ.); Effect of Idle Land Upon Grasshopper Populations, by F. G. Butcher (pp. 647-649) (N. Dak. Agr. Col.); The Blueberry Bud Mite [*Eriophyes vaccinii*], a New Pest, by B. B. Fulton (p. 699) (N. C. Expt. Sta.); The Titratable Acidities and pH Values of Cryolite Insecticides, by R. H. Carter (p. 699), Effects of Phenothiazine on Chicken Lice [the Chicken Head Louse, the Chicken Body Louse, the Shaft Louse *Menopon gallinae* (L.), and the Fluff Louse], by H. E. Parish (p. 700), and Fire Ants [*Solenopsis ryloni* MacCook] Causing Damage to Telephone Equipment, by C. Eagleson (p. 700) (all U. S. D. A.); Light Trap for Counting or Collecting Leafhoppers on Lettuce Plants, by T. C. Watkins (p. 701) (Cornell Univ.); Distribution and Hosts of Some Fleas of Economic Importance [the Cat Flea, Dog Flea, Human Flea, Oriental Rat Flea, and the Sticktight Flea], by H. L. Trembley and F. C. Bishopp (pp. 701-703) (U. S. D. A.); Dichlorethyl Ether as a Means of Control for Pear Thrips, by S. C. Jones (p. 703) (Oreg. Sta.); *Cyclocephala immaculata* Oliv. as a Test Insect, by P. O. Ritcher (p. 704) (Ky. Sta.); and An Agromyzid Fly [*Agromyza caerulea* Mall.] Infesting Sweetpotato Seed in Puerto Rico, by W. K. Bailey and H. K. Plank (pp. 704, 705) (P. R. Sta.).

[Work in economic entomology by the Georgia Station] (*Georgia Sta. Rpt.* 1940, pp. 48, 58-64, fig. 1).—The work of the year (E. S. R., 82, p. 792) reported upon includes control of the sheep tick and the sheep louse *Trichodectes ovis*, the cowpea curculio, tomato fruitworm, southern corn rootworm, a mite

(possibly *Paratetranychus ununguis* Jac.) on water oaks and willow oaks, the velvetbean caterpillar on peanut plants, and a study of the effect of the abnormally cold winter on insect life.

[Contributions on economic insects and their control] (Kans. State Hort. Soc. Bien. Rpt., 45 (1938-39), pp. 29-48, 169-196, 239-242).—Among the contributions presented are the following: Lead Arsenate Combinations and Nicotine Combinations as Control Measures for the Codling Moth During the Season of 1938 (pp. 29-37) and Control of American Strawberry Leafroller *Ancylis comptana fragariae* Walsh and Riley During the Season of 1938 (pp. 39-46), both by P. G. Lamerson and R. L. Parker (Kans. Expt. Sta.); Some Entomological Problems, by H. B. Hungerford (pp. 47, 48); Some Insects Causing Injury to Shade Trees in 1939—Red Cedar Scale *Cryptaspidiotus shasta* (Coleman), by G. A. Dean (pp. 169-172); Lead Arsenate Combinations and Basic Copper Arsenate as Control Measures for the Codling Moth During the Season of 1939 (pp. 173-179) and Control of the American Strawberry Leafroller During the Season of 1939 (pp. 181-186), both by R. L. Parker and P. G. Lamerson (Kans. Sta.); Codling Moth Studies in Northeastern Kansas and Northwestern Missouri During 1939, by H. Baker (pp. 187-196) (U. S. D. A.); and Insects Which Attack the Redbud [*Cercis canadensis*], by R. L. Parker (pp. 239-242) (Kans. Sta.)

[Work in economic entomology by the Rhode Island Station] (*Rhode Island Sta. Rpt.* [1939], pp. 20, 24, 41).—Brief reference is made (E. S. R., 81, p. 808) to control work with root maggots on cauliflower and early cabbage, green cabbageworms, flea beetles on tomato plants, bean beetle, webworms and cutworms on velvet bentgrass, and ants in golf greens and lawns.

The history of the Riker mount, S. F. BAILEY. (Univ. Calif.). (*Ent. News*, 51 (1940), No. 4, pp. 91-94).

Further tests with concentrated mixtures for aerial spraying, S. F. PORTS and R. R. WHITTEN. (U. S. D. A.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 676-681, figs. 2).—Further work (E. S. R., 82, p. 71) was conducted with the view to determining (1) whether certain concentrated spray mixtures can be successfully applied from the air and (2) the comparative merits of various spreading agents, adhesives, arsenicals, and substitutes for arsenicals when applied in concentrates. Twenty-two mixtures were applied to woodland plats by an autogiro. Fresh foliage from most of the plats was then fed to fourth- and fifth-instar larvae of the orange-striped oak worm. The arsenical sprays were found more toxic than were the organic sprays after longer periods of exposure. "The toxic principles of derris, derris extract, nicotine sulfate, free nicotine, and quebracho-fixed nicotine remained on the foliage in effective quantities after 2 to 3 weeks' exposure. With the exception of lime-sulfur, none of the mixtures caused any injury to wild black cherry foliage. Non-drying oils and spreaders reduced adherence, but drying oils increased adherence. Mixtures containing a drying oil, such as fish oil, gave a heavy deposit and good adherence after 4 in. of rainfall. Two-tenths of a pound of fish oil per pound of arsenical gave sufficient adherence for most conditions. Certain spreaders increased the atomization, width of swath, and spreading qualities of the mixtures. They facilitated the mixing of the materials and made possible a considerable reduction in the amount of water required to make a fluid mixture. One and one-half lb. of water per pound of lead arsenate was sufficient for good results when a spreader was added."

Certain new coal tar insecticides, W. C. FERGUSON. (Ohio State Univ.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 596-600).—Description is given of new materials derived from low-temperature tar which have shown insecticidal

value against certain insects. "Five-tenths percent and 1 percent heavy oil dusts, 1 percent and 6 percent brown solution dusts, and 10 percent copper pitchate dust proved to be as effective against the larvae of [the] Mexican bean beetle as 0.75 percent rotenone dust and cryolite dust. It was indicated that 1 percent heavy oil dust, 10 percent copper pitchate dust, and 10 percent pitch acid dust gave as good control of potato leafhopper on bean at Columbus, Ohio, as did pyrethrum-sulfur dust."

Low temperature tar oil in orchard sprays, W. C. FERGUSON and D. M. DeLONG. (Ohio State Univ.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 600-610, figs. 6).—In an effort to evaluate low-temperature tar oil as a tree spray oil, field and laboratory tests were conducted in 1938 and 1939. Such tar oil differs from high-temperature coal tar oil chiefly in its higher percentage of tar acids (of high boiling range) and of paraffins, and its lower percentage of aromatics. It was found that as an ovicide against apple aphids "tree spray oil from low-temperature tar is as effective as is a tree spray oil from high-temperature tar, both used at 2.5-percent concentration. In one instance a 1.5 percent low-temperature tar oil spray gave adequate control against these pests. The addition of petroleum oil to tar oils in usual proportions does not affect their value as aphid ovicides. A 4.5 percent low-temperature tar oil spray shows equally as good control in the field against the eggs of European red mite as a 2 percent Dowspray Dormant. In this spray, the stock emulsion of which was compounded with lignin by means of the colloid mill and contained 2.5 percent low-temperature tar oil plus 2 percent petroleum oil, it is apparent that the tar oil when used in this proportion depresses or counteracts the toxic effect of the petroleum oil against the red mite eggs. When a spray containing 3.24 percent low-temperature tar oil plus 2.16 percent petroleum oil was used (5.4 percent total), good control of the mite was obtained. Thus it seems that a small addition of low-temperature tar oil depresses the effect of the petroleum oil, but a larger addition of the tar oil adds some potency of its own against the European red mite. A 1.7 percent low-temperature tar oil plus 2 percent Diamond Paraffin oil spray gave the most economical mite control of all the sprays tested, but it is questionable whether a sufficient factor of safety is present to assure good control all of the time. Against the egg stage of oystershell scale a 4.5 percent low-temperature tree spray oil proved to be significantly better than a high-temperature tar oil spray of the same concentration. Other sprays giving good control, with no significant difference between them, were 'Tar-O-Wash' containing 2.8 percent high-temperature tar oil and 3.5 percent petroleum oil, a low-temperature oil-Diamond Paraffin oil of the same concentration as Tar-O-Wash, and a low-temperature tar oil-Diamond Paraffin oil combination 4.0-0.5.

"When applied in the dormant or delayed dormant stages to apple trees, low-temperature tree spray oils, when properly emulsified and applied, showed little or no injury to the buds or foliage. In fact, the oil in most cases showed superior lateral bud development of the treated trees over those which were untreated. There was no injury to either the Hale or Elberta peach varieties by the low-temperature tar oils. . . .

"Preliminary results of plate-oil deposit studies conducted in the laboratory indicate that a 1-1.5-100 bordeaux combination is sufficient emulsifier to give a safe, fairly slow-breaking emulsion containing 2.5 percent low-temperature tree spray oil. Photographs accompanying this paper show at a glance the oil deposit obtained from the various tank-mixed sprays."

Phytotoxic properties of undiluted low-boiling petroleum oil distillates, T. O. ALLEN and T. L. CARPENTER. (Wis. Expt. Sta.). (*Jour. Econ. Ent.*, 33

(1940), No. 4, pp. 591-596, fig. 1).—In the work reported, use was made of a method devised whereby a constant and known amount of undiluted, low-boiling petroleum oil distillates could be applied to plant foliage in the field. "Under similar refinement, results indicate that distillates of Midcontinent base crudes were slightly more toxic to plant foliage than paraffin base crudes. Such distillates, however, derived from Midcontinent crudes caused relatively little injury to plants when treated with 130 lb. of fuming sulfuric acid per barrel of oil. Distillates derived from Pennsylvania crudes caused relatively little injury to plants when treated with 100 lb. of fuming sulfuric acid per barrel of oil. Under the conditions of this experiment, fractions having a kinematic viscosity of approximately 1.7 centistokes proved least toxic."

Relative susceptibility of the ootheca and adult female of the German cockroach to liquid household insecticides, B. M. PARKER and F. L. CAMPBELL. (Ohio State Univ.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 610-614). In the work reported, kerosene sprays containing extracts of pyrethrum gave a high kill of adult female German cockroaches when applied by the settling mist method at certain concentrations and dosages. Under this treatment the majority of the insects dropped their oothecae prematurely. "It was concluded that when a high kill of females is obtained by pyrethrum sprays, the females are more susceptible to this insecticide than are their oothecae. With the possible exception of the large nymphs, the ootheca is the most resistant stage of the German cockroach to pyrethrum sprays. The effect of the pyrethrins on females and their oothecae was compared with that of other toxicants. At an unusually high concentration normal butyl carbithiol thiocyanate gave about the same percent mortality of females and oothecae as did the pyrethrins. However, this thiocyanate did not cause the females to drop their oothecae, although its paralytic effect was greater than that of the pyrethrins. It was concluded that this thiocyanate had some insecticidal value against the oothecae at the concentration used, but that the females were more susceptible than their oothecae. At the concentrations used, cresylic acid was comparable to the thiocyanate and rotenone to the pyrethrins. Neither substance caused the females to drop their oothecae and neither caused marked mortality among the females or their oothecae."

The effect of alkaline dust diluents on toxicity of rotenone-bearing roots as determined by tests with houseflies, T. C. ALLEN and J. W. BROOKS. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 60 (1940), No. 12, pp. 839-845).—Determination of the pH value of a number of insecticidal dust diluents has shown these materials to vary in H-ion potential from 4.23 to 12.50. Representative samples of these dusting materials, which varied widely in H-ion potential, were mixed with rotenone-bearing plants and placed in damp storage in the absence of light for a period of 7 days. Kerosene extracts prepared from these dust mixtures were tested against houseflies. Rotenone-bearing dusts prepared from highly alkaline diluents showed considerable loss in toxicity, while acid samples kept under identical conditions retained their toxicity to the housefly. Dry or unmoistened alkaline and acid samples remained unchanged in this respect. Addition of sulfur to the alkaline dust mixtures prevented deterioration of the rotenone-bearing material under the conditions of this experiment.

Avoiding obvious residue from nicotine-bentonite sprays, C. G. VINSON and S. A. McCORMY. (Mo. Expt. Sta.). (*Science*, 92 (1940), No. 2378, p. 79).—In reporting further (*E. S. R.*, 80, p. 224), sprays consisting of combinations of Black Leaf 40 and dry bentonite are said to leave no visible residue on fruit or foliage. They gave results that compare very favorably with the standard lead arsenate spray.

Spray residues as affecting the processor, I. D. CARDIFF (*Cong. Rec.*, 86 (1940), No. 124, pp. 13447-13449).—In the course of this discussion, the author considers the origin of the spray residue problem; lead, arsenic, and fluorine in nature; physiological effects of lead, arsenic, and fluorine; lead and arsenic in medicine, legal aspects, etc.

Tests of insecticides for certain cotton insects during 1939, J. C. GAINES. (Tex. Expt. Sta. and U. S. D. A.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 684-688).—Tests conducted at the station in 1939 to determine the comparative effectiveness against the bollworm and bollweevil of a specially prepared calcium arsenate, a commercial calcium arsenate, and a synthetic cryolite are reported. An infestation of the rapid plant bug that developed on one of the plats made it possible to obtain some information on the action of the arsenicals on this pest also. "The special calcium arsenate, containing large particles and a high percentage of water-soluble arsenic pentoxide, gave a significantly better control of the rapid plant bug than the commercial calcium arsenate. This poison gave a higher control of the bollweevil and a higher yield than the commercial calcium arsenate, but the differences were not found to be significant. Calcium arsenate gave significantly better control of weevils than cryolite, but this year under dry weather conditions which caused excessive shedding this difference did not affect the yields. In a preliminary test sulfur-calcium arsenate mixture (2 to 1) applied at the rate of 15 lb. per acre gave 89, 39, and 61-percent control of the flea hopper, rapid plant bug, and bollweevil, respectively."

Vegetable insect pests in Hong Kong, I, II, K. CHAN (*Hong Kong Nat.*, 9 (1939), No. 4, pp. 199-202, figs. 2; 10 (1940), No. 2, pp. 98-101, figs. 7).—Part 1 reports upon the cabbage worm *Pieris canidia* Sparrm, one of the most destructive pests in Hong Kong market gardens; part 2, upon the diamondback moth, of great importance as a pest of cultivated crucifers.

[Contributions on fruit insects and their control] (*Amer. Pomol. Soc. Proc.*, 55 (1940), pp. 25-31, 82-85, 184-201).—Included in the contributions presented at Worcester, Mass., in January 1940 are the following: Scope and Method of the Lead Arsenate Spray Residue Health Investigation, by W. C. Dreessen (pp. 25-31); Orchard Insect Pests in 1939, by W. D. Whitcomb and A. I. Bourne (pp. 82-85); and a round table discussion of insects and control methods by W. H. Thies et al (pp. 184-201).

Survey of fruit insect pests in Massachusetts in 1938, W. D. WHITCOMB and A. I. BOURNE (*Mass. Fruit Growers' Assoc. Rpt.*, 45 (1939), pp. 28-32).

Fall clean up of citrus insects, J. R. WATSON. (*Fla. Expt. Sta.*). (*Fla. Grower*, 48 (1940), No. 9, p. 15).

Certain sucking insects causing injury to rose, F. F. SMITH. (U. S. D. A.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 658-662, figs. 3).—In observations of 44 insects as vectors of mosaic and streak disease of the rose, several species not usually recognized as attacking roses were found to feed or to breed on this host for an extended period. Injuries, including yellowing and necrosis by the yellow-headed leafhopper and the potato leafhopper, stippling by the apple leafhopper, *Erythroneura* sp., and the white apple leafhopper, speckling by *Mycus porosus*, and general dwarfing by aphids and mealybugs, are described. Differential characters of stippling and of fecal deposits are given for identifying the injuries caused by the several species of *Empoasca*, *Erythroneura*, and *Typhlocyba*.

Additions to annotated lists of insects reared from elm bark and wood, C. H. HOFFMANN. (U. S. D. A.). (*Bul. Brooklyn Ent. Soc.*, 35 (1940), No. 2, pp. 54-63).—These additions to the earlier annotated lists by Pechuman and Kaston (*El. S. R.*, 78, p. 660; 79, p. 359) are arranged by order and family.

The principles of fumigation of insect pests in stored produce, A. B. P. PAGE and O. F. LUBATTI (*London: Dept. Sci. and Indus. Res.*, 1940, pp. [3]+28, figs. 7).

Lures and traps to control clothes moths and carpet beetles, H. F. WILSON. (Univ. Wis.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 651-653).—The observations conducted demonstrated that clothes moths and carpet beetles can be lured by bait materials and that fairly heavy infestations can be reduced beneficially. A series of experiments show that large numbers of adult clothes moths can be caught on baited fly rolls and that carpet beetle and clothes moth larvae can be lured into baited traps laid on the floor. It was also found that clothes moths were attracted to such traps and laid eggs on the cloth pads contained in the traps.

Insect activity at a light trap during various periods of the night, R. E. HUTCHINS (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 654-657, figs. 4).—The observations reported have shown that there is a constant shifting in the abundance or activity of insects at a light trap during the night. Thus, a group or species may become extremely active for a brief period, then suddenly disappear. In nearly every case the abundance of male Lepidoptera at the trap increased considerably until 1 a. m. and then decreased, while female abundance remained nearly constant. The period of night between 1 and 3 a. m. appeared to be the turning point in the locality under observation for the activity of nearly all the major insect groups.

Notes on *Chaetothrips orchidii* (Moulton) found attacking citrus fruit in Florida, W. L. THOMPSON. (*Fla. Expt. Sta.*). (*Fla. Ent.*, 22 (1939), No. 4, pp. 65-67).—These notes relate to a thrips, *O. orchidii*, found in 1937 to have been the cause of surface markings on mature grapefruit grown near Cocoa, Brevard County, Fla. A similar injury to oranges in California, as reported by Boyce and Mabry (*El. S. R.*, 78, p. 819), and to grapefruit in Honduras is said to have been caused by the greenhouse thrips. Thus far commercial damage has been observed in only a limited number of groves, and in each case no sulfur or only a minimum number of sulfur sprays had been applied during the spring and summer. "In one portion of a commercial grove an unsprayed check plat had thrips injury on 57 percent of the fruit hanging singly and 70 percent of the fruit hanging in clusters. Sulfur sprays applied for rust mite control are apparently a factor in keeping the thrips population at a minimum. In various experimental plats receiving sulfur sprays there was less marked fruit than in the unsprayed checks, although none of the sprays were applied for thrips control. In one preliminary experiment for thrips control on grapefruit the thrips population was decreased 84 percent with 1.5 percent lime-sulfur solution supplemented with 6 lb. of wettable sulfur per 100 gal."

A synopsis of the Hemiptera-Heteroptera of America north of Mexico, J. R. DE LA TORRE-BUENO (*Ent. Amer.*, n. ser., 19 (1939), Nos. 3, pp. 141-206; 4, pp. 207-304, figs. 17).

Additions and corrections to "A synopsis of the Hemiptera-Heteroptera of America north of Mexico," part 1, J. R. DE LA TORRE-BUENO (*Bul. Brooklyn Ent. Soc.*, 35 (1940), No. 2, pp. 51-53).—Additions and corrections to the work noted above are presented.

The effect of fertilizers on chinch bug resistance in sorghums, R. G. DAHMS and F. A. FENTON. (U. S. D. A. and Okla. A. and M. Col.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 688-692, figs. 4).—In pot and field experiments at Lawton, Okla., in continuation of earlier studies (*El. S. R.*, 76, p. 506) with Atlas sorgo, Dwarf Yellow milo, and Finney milo sorghums, their resistance to chinch bug attack was consistently decreased by sodium nitrate, and in the

majority of cases increased by superphosphate, applied to the soil in which the plants were grown. Results in pot experiments were variable, the resistance of Atlas sorgo being in most cases apparently somewhat decreased and that of Dwarf Yellow milo somewhat increased.

The 1939 green bug outbreak in Oklahoma, F. A. FENTON and E. H. FISHER (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 628-634, figs. 6).—A severe outbreak of the green bug in northeastern Oklahoma in the spring of 1939 resulted in an estimated loss of over half a million dollars to small grain crops. Winter barley was more severely damaged than winter wheat, and the greatest damage was inflicted on spring oats. There is said to be some evidence of comparative resistance of some oats varieties to green bug damage. Fall-planted barley, oats, and wheat were much more severely damaged following grain sorghums in a rotation than following soybeans, corn, or wheat. "In all fields studied, the parasite *Lysiphlebus testaceipes* did not occur in sufficient abundance to check the green bug until after the infestation had declined to a low point or until the grains had already been damaged beyond recovery. The most important predator was *Hippodamia convergens*, the larvae of which were abundant at the peak of the green bug infestation."

Differential susceptibility of corn hybrids to *Aphis maidis*, E. V. WALTER and A. M. BRUNSON. (U. S. D. A. and Ind. Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 623-628, fig. 1).—In observations made during the summer of 1939 on the abundance of corn leaf aphids on 225 inbred and 486 hybrid strains of corn grown on a farm of the Indiana Station, consistent differences between inbred lines in behavior toward aphid attack were indicated. These ranged from the extreme susceptibility of 38-11 and 4-8 with 100 percent of the plants infested to the practical immunity of 2 strains with no infestation. The severity of infestation and the parts of the corn plant attacked also varied with the inbred, the lower part of the tassels being the most favored point of attack, and the ear shoots, silks, and upper leaves of the more susceptible varieties also being infested. Individual inbreds differed greatly in prepotency in transmitting susceptibility or resistance to their hybrids. In general hybrids were less heavily infested than the parental inbreds, although combinations involving 1 inbred strain provided a notable exception. No plant character or group of characters was found to be consistently correlated with aphid susceptibility.

Control of the pea aphid in eastern Virginia in 1939, H. G. WALKER and L. D. ANDERSON. (Va. Truck Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 620-623).—Experiments conducted in the spring of 1939, when a very severe outbreak of the pea aphid occurred on canning peas on the Eastern Shore at about the time the first pods were beginning to set, are reported. "Vaporized nicotine and a 4 percent nicotine-copper-lime dust gave higher initial kills of pea aphids than did derris-talc dusts containing 1 percent rotenone, but the derris dusts had more residual effect than did the nicotine materials. Derris-talc dusts containing 1 and 3 percent Vatsol OS [sodium salt of an alkyl naphthalene sulfonic acid, practically 100 percent pure] were not significantly different from each other, but both were more effective than a similar dust that did not contain a wetting agent. Peas treated with each of these materials produced highly significant increases in yield over the untreated check plats. In commercial control work by pea growers, vaporized nicotine gave uniformly good control of the pea aphid, whereas derris dusts were reported as giving good results in some instances and poor results in others. An atomized oil containing rotenone and nicotine gave high kills of the aphids hit, but due to the poor coverage obtained failed to give entirely satisfactory results."

The species of *Aphidius* (Aphidiinae: Braconidae) as parasites of aphids in South Africa, G. C. ULLYETT (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 178 (1938), pp. 28, figs. 9).—Braconid parasites of the genus *Aphidius*, which attack aphids in South Africa, are dealt with, part 1 (pp. 6-14) relating to their morphology, part 2 (pp. 13-16) to bionomics and biology, and part 3 (pp. 16-27) to the value of *Aphidius* in the complex.

A survey of the pineapple mealybug in Puerto Rico and preliminary studies on its control, H. K. PLANK and M. R. SMITH. (Coop. U. S. D. A.) (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 24 (1940), No. 2, pp. 49-76, figs. 6).—A field survey of conditions in four main pineapple-growing districts of Puerto Rico revealed a pineapple mealybug infestation of 87.1 percent of pineapple plants ranging from 9 mo. to about 2 yr. of age. Infestation in individual fields varied from 66.7 to 100 percent of the plants examined, and about as many plants were found infested on the inside of the fields as along the edges. "All parts of the pineapple plant were seen infested, roots, leaves, and fruits, as well as the stem. Wherever heavily infested plants were found they were usually stunted, chlorotic, and often wilted, and the fruits were much reduced in size.. Under conditions of severe infestation the normal yield has been estimated to be reduced by 36 percent. Including the pineapple, 25 species of host plants of the mealybug have been recorded in Puerto Rico. Evidence obtained showed that the mealybug was widely distributed in the parts of the island where examinations were made, and that certain grasses and weeds in a pineapple field or near the edges can harbor the mealybug and act as reservoirs from which the pineapples will later be infested.

"The pineapple mealybug was seldom found unattended by ants. Sixteen species of ants were found associated with this insect, all but 2 of these being observed attending the mealybug on pineapple plants. The fire ant, the most important species, was found in this association on over 43 percent of the infested plants on which ants were present. Three species of ants were frequently seen carrying young mealybugs about in the fields. The greater frequency with which ants were found attending mealybugs on pineapple plants on the edges of the fields, as compared with that on the inside, indicated a definite relation of the surrounding vegetation to the ant distribution within the field itself. That ants do spread the mealybug from infested to uninfested plants was shown experimentally. The larvae of 2 small moths, 1 a tineid and the other a pyralid, and the larvae of a small cecidomyiid fly, all found living in large groups of mealybugs, were thought to be predators of this pest. Two hymenopterous parasites have been recently introduced, but only 1 has as yet become established in pineapple fields of the island.

"In experiments with methods to clean planting stock of mealybugs, submersion of pineapple slips in water for 96 hr. under the conditions described resulted in a 99.13-percent kill of the mealybugs but also killed over half the plants. Submersion for 72 hr. produced 92.04-percent control but so injured 15.5 percent of the plants that they later died, and among those that survived an average of 5 living mealybugs were found on each infested slip. Treating the slips in a closed room with moisture-saturated air at 46° C. (about 115° F.) for 6 hr. seemed to produce the most satisfactory results; 97.93 percent of the mealybugs were killed by this treatment, and although 10.5 percent of the slips still contained living mealybugs, the number averaged only 1 mealybug per slip. None of the planting stock was lost, and instead of injuring the slips this treatment seemed to stimulate their later growth."

On the nature and origin of the diapause in *Platyedra gossypiella* Saund., F. A. SQUIRE (*Bul. Ent. Res.*, 31 (1940), No. 1, pp. 1-6, fig. 1).—Report is made

of a study in Trinidad of the condition termed diapause (including hibernation, estivation, and diapause manifestations), characterized by a marked depression of metabolism and quiescence, of which the "remote causes as suggested by observation are cold, heat, drought and (or) certain nutritional peculiarities such as richness or dryness of food. These factors may act singly or in combination, with different factors dominant in different cases." It is concluded that all the remote causes of diapause may be reduced in physiological terms to an unfavorable free water balance. In the case of the pink bollworm, nutrition is the dominant factor causing this moisture deficiency, for, as is shown, the larvae are subject more and more, as the crop advances, to food that is both drier and richer in oil.

Effect of the mechanical husker in corn borer control, L. L. HUBER. (Ohio Expt. Sta.) (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 643, 644).—It is stated that there is no evidence that the use of the mechanical husker has directly or indirectly played a leading role in increasing corn borer population, and that there can be no entomological objection to its use.

The bean pod borers in Puerto Rico, L. B. SCOTT. (U. S. D. A.). (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 24 (1940), No. 2, pp. 35-47, figs. 2).—A study of three species of pod borers, namely, *Maruca testulalis* (Geyer), the lima bean pod borer, and the Caribbean pod borer, found commonly in 1935-36 infesting wild and cultivated legumes in all parts of Puerto Rico, is reported. The first two mentioned were equally numerous, but *M. testulalis*, due to its confining its attacks almost entirely to cultivated plants, was by far the most important economically. The Caribbean pod borer was the least abundant, and although found largely in cultivated plants, was much less destructive than either of the other two. In addition to various legume crops, the three borers attacked several wild legumes, particularly *Crotalaria incana*, one of the island's commonest crotalarias, and *Canavalia maritima*, commonly called the bay bean. Some wild legumes, such as the wild lima bean (*Phaseolus lunatus*) and one of the commonest crotalarias (*C. retusa*), appeared to be highly resistant, if not immune, to attack. Experiments conducted at Yauco, Isabela, and Mayaguez indicated that the pod borers could be successfully controlled by two 25-lb.-per-acre applications of dust containing 80 percent of natural cryolite. Similar applications of pyrethrum dust were moderately effective, but the cost of the material was prohibitive. Dusts and sprays containing rotenone failed to provide satisfactory control. Observation of various varieties and types of lima beans indicated that the small-seeded lima bean, particularly the variety Carolina, was highly resistant to pod borer attack.

A list of the butterflies of Michigan, S. MOORE (*Mich. Univ., Mus. Zool. Occas. Papers*, No. 411 (1939), pp. 23, fig. 1).—This list, based upon all previously published records and examinations of collections, lists 124 species as known from the State. Dates, localities, and collection are included.

An outbreak of the velvetbean caterpillar in Alabama, with data on control, F. E. GURTON. (Ala. Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 635-639, fig. 1).—An extensive outbreak of the velvetbean caterpillar in peanut fields in 1939 led to the control work here reported, the details of which are given in two tables. "Lead arsenate, applied in dust form at the rates of 8 and 10 lb. per acre, gave an average of 91-percent control of the velvetbean caterpillar on peanuts. It caused no burning of leaves. Calcium arsenate dust, applied at the rates of 8 and 10 lb. per acre, gave an average of 89-percent control but caused burning of peanut foliage in almost every instance. Timbo dusts containing 0.5 percent and 1 percent rotenone were in-

effective as controls for the velvetbean caterpillar. Neither lead nor calcium arsenate gave effective control when mixed with more than an equal part of a diluent. Peanut was the principal host plant of the velvetbean caterpillar in Alabama in 1939. Soybeans, velvetbeans, and kudzu were also severely damaged in certain sections of the State. The maximum kill from the arsenicals used in this experiment occurred 3 to 4 days after exposure. Data obtained were not satisfactory for determining the effect of complete defoliation of the plants on yield of peanuts."

The biology of a tachinid parasite, *Sturmia rhodesiensis* sp. n., of the cotton boll worm *Heliothis armigera* Hubn. in Southern Rhodesia, E. PARRY JONES (*Brit. So. Africa Co. Pub. 7* (1938), pp. 11-34, pls. 4).—A report of studies of a new tachinid parasite, here described as *S. rhodesiensis* n. sp. (= *S. halli* Curran 1939),¹ which was found at Mazoe and is one of the most important of the dipterous enemies of the bollworm. Though at first confused with *S. munroi* Curran, an examination of the terminalia revealed a distinct difference. "*S. rhodesiensis* is one of the first of the tachinid species to emerge in the spring, i. e., at the end of August and during September. Several generations are passed through during the summer, but the species overwinters in the pupal stage. The duration of the overwintering puparia varies from 99 to 175 days. The percentage parasitism of the bollworm has been determined during the citrus [fruit] infestation in September and October and during the last summer generation of the host in April and May for the year 1934 to 1938. The parasitism for these two periods varies from 14.7 to 24.8 percent and from 3 to 4.8 percent, respectively. In both periods *S. rhodesiensis* has been found to be one of the most active of the tachinid species attacking the bollworm. No other host of the species has been recorded so far."

Insect cultures inbred for 200 generations, D. F. MILLER. (Ohio State Univ.). (*Science*, 92 (1940), No. 2381, pp. 147, 148).—Report is made of the laboratory rearing of the blowflies *Lucilia sericata* and *Phormia regina* through approximately 200 generations in the course of 10 yr. These inbred blowflies are said to have lost nothing in vigor and to be well adapted to laboratory rearing and uses. After experimentation in which many foods were tested, the procedure adopted consisted of feeding the adults on lean beef, which was essential to egg development, and brick sugar. Fresh tap water was supplied at all times. The maggots were fed fresh hamburger. It is said that no other food was used over a period of 8 yr.

Methods of destroying blowfly larvae and pupae in carcasses and in soil, A. L. BROADY and E. F. KNIPLING. (U. S. D. A.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 662-665).—The results of tests of chemical, mechanical, and burning methods, conducted at Valdosta, Ga., with a view to determining the most effective means of destroying the screwworm and other blowfly larvae in carcasses and soil, are reported. Sodium cyanide at the rate of 1 oz. in from $\frac{1}{2}$ to 2 gal. of water was found to kill all the larvae and pupae in the soil and at the rate of $\frac{1}{2}$ oz. in from 1 to 2 gal. of water was over 98 percent effective in preliminary tests on 1-sq. yd. plats. "In tests on larger plats, sodium cyanide in concentrations of $\frac{1}{2}$ and $\frac{1}{4}$ oz. per gallon of water applied at the rate of 2 gal. per square yard killed all larvae in carcasses and in the soil on which the carcasses had laid, while $\frac{1}{8}$ oz. per gallon of water at the same rate killed 98 percent of the larvae and pupae in the soil. Carbon disulfide emulsion ($\frac{1}{4}$ pt. of equal parts of carbon disulfide and sulfonated castor oil in 2 gal. of water) destroyed all larvae and pupae in soil when applied at the rate of 2 gal. per square yard. Pounding the soil seemed to be effective on improved

¹ Amer. Mus. Novitates, No. 1022 (1939), pp. 5.

pasture sod but relatively ineffective on rough woodland pastures." It was found that in carcasses and soil the screwworm may be destroyed with a prickly pear burner using gasoline or kerosene. Top burning of the carcasses and soil and burning by the trench method, followed by spreading the fire over the soil, was more effective than trench burning of the carcasses with wood, which was the least effective. It is pointed out that the fire should be spread over an area extending at least 3 ft. from the carcass in all directions. Burning carcasses and heating the soil on which they have laid, if conducted with thoroughness, will kill blowflies that are present in the carcass and soil.

The toxicity of phenothiazine and certain related compounds to young screwworms, R. C. BUSHLAND. (U. S. D. A.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 666-669).—In laboratory tests conducted with a view to determining the toxicity of phenothiazine and a number of related organic compounds to young screwworm larvae, the following were found to be toxic at concentrations of 0.67 percent or less: "Acridine, *p*-dibenzodioxin, dibenzothiophene, dibenzyl, 5,10-dihydroacridine, 9,10-dihydroanthracene, diphenyl, diphenylamine, diphenylene oxide, diphenylmethane, diphenyl sulfoxide, phenazine, phenothiazine, phenothioxin, phenoxazine, phenyl ether, and phenyl sulfide. Compounds found to be nontoxic at a concentration of 0.67 percent were anthracene, carbazole, diphenyl sulfone, phenothiazine sulfoxide, and thianthrene." A discussion of the relationship between molecular structure and toxicity to screwworm larvae is included. It is apparent that any alteration of the molecule in these compounds may influence toxicity.

The toxicity of some organic compounds to young screwworms, R. C. BUSHLAND. (U. S. D. A.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 669-676).—In continuation of the work above noted, laboratory tests were made of 551 organic compounds with a view to determining their efficiency in the field in protecting wounds against screwworm infestation. Of these, listed according to minimum lethal concentration and relative toxicity with regard to phenothiazine and rotenone, "284 showed little or no toxicity at a concentration of 0.67 percent, 190 killed all larvae at concentrations of 0.17 to 0.67 percent, and 77 compounds, considered to be of outstanding toxicity, were lethal at a concentration of 0.1 percent or less. Of these highly toxic compounds, 10 were less toxic than rotenone, 25 were equal in toxicity to rotenone (minimum lethal concentration 0.05 to 0.08 percent), 31 were equal in toxicity to phenothiazine (minimum lethal concentration 0.03 to 0.05 percent), and 11 were more toxic than phenothiazine (minimum lethal concentration 0.03 percent or less). The 11 compounds found to exceed phenothiazine in toxicity were: Cinchonine, *m*-dinitrobenzene, 2,6-dinitro-4-chlorophenol, 3,5-dinitro-*o*-cresol, 2,4-dinitro-6-cyclohexylphenol, methylphenylnitrosoamine, *o*-nitroanisole, *p*-nitroanisole, *p*-nitrobenzonitrile, *p*-nitrophenetole, and *p*-nitrophenylacetoneitrile. Although these studies have revealed no basis from which the toxicity of a prospective larvicide can be definitely predicted, it is evident that some groups show more promise than do others. For example, of 158 nitro compounds 36 were outstandingly toxic, while of 51 compounds containing a primary amino group only 1 showed outstanding toxicity. Of the compounds comprising quinoline and 16 of its derivatives, all were toxic to the screwworms and 12 of them outstandingly so."

Sheep maggot-fly problem: New Zealand survey, 1937-38, D. MILLER (*New Zeal. Jour. Sci. and Technol.*, 21 (1939), No. 4A, pp. 240A-244A, fig. 1).—A report is made upon maggots from struck sheep received from various parts of New Zealand and flies reared therefrom. The results are analyzed so far as the limited data allow from the points of view of (1) causes of strike, (2)

species of flies concerned, and (3) the apparent zones in which the 2 primary flies (*Calliphora laemica* and *Lucilia sericata*) dominate. Of the 14,843 flies reared during the observations, *C. laemica* composed 49 percent, *L. sericata* 46.27, *Chrysomya rufifacies* 1.4, the false stablefly 1.36 and *Calliphora quadrimaculata* 1.2 percent, with 7 species representing less than 1 percent each.

Dipterous larvae and wound treatment. A. D. IMMS (*Nature* [London], 144 (1939), No. 3646, pp. 516, 517).—A brief summary of the present status of knowledge of the subject as known to the author.

The mosquitoes of Arkansas. S. J. CARPENTER (*Little Rock, Ark.: State Bd. Health, 1939, pp. [4]+89, figs. [32]*).—Following a brief introduction, the habits of mosquitoes, methods and technic employed, structures commonly used in determination of species, seasonal occurrence of the different species met with in Arkansas, a key to adult female mosquitoes, and a key to the larvae of Arkansas mosquitoes are presented and descriptions given of 42 species occurring in the State, including 5 of *Anopheles*, 7 *Culex*, 15 *Aedes*, 9 *Psorophora*, 2 *Theobaldia*, and 1 each of *Mansonia*, *Orthopodomyia*, *Uranotaenia*, and *Mogarrhinus*. The work concludes with a discussion of methods of mosquito control by natural factors and artificial measures, a report of studies of flight range of the common malaria mosquito, and a list of 48 references to the literature.

Viability of *Aedes aegypti* eggs. J. H. LE VAN (*Pub. Health Rpts. [U. S.]*, 55 (1940), No. 20, p. 900).—In an experiment conducted, it was shown to be possible for yellow-fever mosquito eggs to remain viable in the vicinity of Miami, Fla., for at least 1 yr. It is pointed out that no freezing weather occurred during the experimental period.

The biology and control of wireworms: A review of the literature. C. A. THOMAS (*Pennsylvania Sta. Bul. 392* (1940, pp. [2]+90)).—This review, presented with a 13-page list of references to the literature, deals with the subject as follows: Biology, life history, and ecology (pp. 2-15); environment (pp. 15-29); biological control of wireworms (pp. 29-37); insecticides used against elaterid larvae (pp. 37-53); attractants and repellents (pp. 54-60); planting practices (pp. 60-64); cultivation practices (pp. 64-70); crop rotation (pp. 70-76); and miscellaneous control methods (pp. 76, 77).

Effects of substitute crops and rotations on wireworm control. W. C. NETTLES. (Clemson Agr. Col.). (*Jour. Econ. Ent.*, 33 (1940) No. 4, pp. 644-646).—It is concluded that substitute crops will unquestionably aid in the solution of the wireworm control problem. Rotations are considered of outstanding importance.

Arsenicals for controlling white grubs in strawberries. T. W. KERR, JR. (Cornell Univ.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 693-698, fig. 1).—The results of control work with the *Phyllophaga* spp. in newly set strawberries in Erie and Steuben Counties, N. Y., are reported, the details being given in table and chart form. "It was found that the application of certain sand and arsenical mixtures, at planting time, to the roots of strawberry variety Premier 1938 and 1939 resulted in a greater percent survival of plants than when the plants were not treated. In the 1938 investigations, where second-year grubs were abundant and where normal moisture conditions existed, 97.5 percent of the plants survived when treated with lead arsenate and sand, 1-20, while the mean percent survival of the plants in six check rows was 55.2. . . . Zinc arsenite, zinc arsenate, and calcium arsenate and sand mixtures were found to be extremely injurious to the strawberries. Arsenic-free ground glass and an aqueous mixture of calomel and gum arabic were both found to be ineffective in preventing white grub injury to strawberry roots. . . . Analyses of the strawberry fruit picked from plants treated with lead arsenate or magnesium arsenate and sand,

mixtures indicate that there is no increase, either in lead or arsenic, over the amount normally present in strawberries."

The cranberry rootworm as an apple pest, S. W. HARMAN (*New York State Sta. Bul.* 692 (1940), pp. 11, figs. 4).—Widely distributed over the United States and primarily a pest of the cranberry, the adult of the cranberry rootworm has for many years attracted attention in western New York, particularly in Wayne County, through its attack upon the apple. In 1928 a grower reported damage through mutilation of his Ben Davis crop to the extent of 70 percent. Fruit injured is unfit for the general market and can only be utilized for canning or evaporated stock. Tests conducted over a 2-yr. period in apple orchards have shown two sprays of lead arsenate, the first applied when the beetles first appeared in the orchard, followed by a second in about 10 days, to provide adequate protection. Usually the first cover spray for the codling moth is applied by the third week in June and is thought to be of considerable value in preventing the rootworm from becoming a common pest in apple orchards. In plantings where it is causing damage, the mid-June spray should be timed with special reference to the emergence of the beetles. The studies have indicated that it prefers a light, sandy soil in uncultivated orchards. The beetle was found to be a general feeder on orchard vegetation.

New baits for the control of the alfalfa snout beetle (*Brachyrhinus ligustici* (L.)), C. G. LINCOLN and C. E. PALM. (Cornell Univ.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 639-643, figs. 8).—In reporting further upon the control of this pest (E. S. R., 33, p. 663), it is stated that, while raisin-shorts-sodium fluosilicate bait still remains the best to use for its control, substitute baits have been found to be nearly comparable in efficiency. "Considering cost, ease of spreading, and availability of materials, corncob, sugar, soybean flour, [and] sodium fluosilicate bait can be recommended for the control of this insect. Bran-sugar-soybean flour-sodium fluosilicate bait compares favorably with the corncob bait, except for the fact that it is more difficult to mix and to spread in the wind."

Boll weevil control with calcium arsenates containing different percentages of water-soluble arsenic pentoxide, R. C. GAINES. (U. S. D. A.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 682-684).—In work in South Carolina, Florida, Mississippi, Louisiana, and Texas, calcium arsenates containing low, intermediate, and high percentages of water-soluble arsenic pentoxide by the New York method were tested against the bollweevil in eight localities in 1938 and five localities in 1939. The average infestation during the 2 yr. in the plats treated with a low percentage was 18.9 percent, intermediate 17.6, high 17.2, and untreated checks 34.7 percent. The average yield in $\frac{1}{60}$ -acre plats treated with low was 24.1 lb. per plat, intermediate 23.2 lb., high 23.3 lb., and untreated checks 19.6 lb.

Special report of North American infestation of *Hypera brunneipennis* on Yuma Reclamation Project, Arizona and California, J. C. HAMLIN (*Calif. Dept. Agr. Spec. Pub.* 174 (1939), pp. 22-25).—Report is made of an investigation of conditions surrounding the *H. brunneipennis* infestation noted by Wehrle (E. S. R., 33, p. 93) in the Yuma area conducted during the last few days of April. Included is a discussion of possible host plant relations and extent of infestation.

Some observations on habits and characteristics of *Hypera brunneipennis* in Yuma County, Arizona, J. L. E. LAUDERDALE (*Calif. Dept. Agr. Spec. Pub.* 174 (1939), pp. 89-91).

Studies of serious bee losses of last few years being made, G. F. KNOWLTON. (Coop. U. S. D. A.). (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 3, pp. 1,

11).—Reference is made to the progress of an investigation commenced in 1939, in which year unusually severe bee losses occurred in Utah. Although arsenical poisoning was suspected, but few samples of bees collected up to June 27, 1940, and analyzed, showed unusual amounts of arsenic. Repeated experimental tests with various grasshopper bait combinations spread near a large apiary in Weber County during August and to mid-September of 1939 indicated that the bees seldom were attracted to such baits during the period under investigation. Similar tests conducted in Cache County during June and July 1940 attracted few honeybees. Observations in tomato fields indicate that honeybees are not particularly attracted to blossoming tomato plants. While the period June 15 to July 15, 1939, was a period of heavy bee loss in Utah, only a few beekeepers reported unusual losses during this period of 1940.

The effect of color of hive covers upon the temperature within the hive, A. V. MITCHENER (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 649, 650).—It is concluded that "hive covers with galvanized metal tops should be painted with at least two coats of a good quality white paint to aid in reducing the temperature within the hives on hot days. Aluminum paint absorbs much more of the heat from the sun than white paint and should not be used with the idea of keeping the hives cool. Unpainted hive covers having galvanized tops absorb practically as much heat as do those painted black."

A review of the parasitic wasps of the ichneumonid genus *Exenterus* Hartig, R. A. CUSHMAN (*U. S. Dept. Agr., Misc. Pub.* 354 (1940), pp. 15, fig. 1).—The need for knowledge of the *Exenterus* parasites of the larvae of pine-feeding sawflies (subfamily Diprioninae), 3 species of which sawflies have recently become established in North America, led to the review here presented. Several exotic species of the genus have been released in eastern Canada and New England, of which *E. marginatorius* (F.), sometimes misidentified as *E. adspersus* (Htg.), has become established. Four species are described as new, namely, *E. flavissimus*, *E. pini*, and *E. tsugae* from North America and *E. vellicatus* from Czechoslovakia and Germany. A key to the separation of the 15 species, 8 of which are North American and 7 exotic, is included.

A study of some factors affecting the efficiency of *Encarsia formosa* Gahan, an aphelinid parasite of the greenhouse white fly *Trialeurodes vaporariorum* (Westw.), H. E. MILLIRON (*Michigan Sta. Tech. Bul.* 173 (1940), pp. 23, figs. 10).—Report is made of studies extending over a period of more than a year, conducted with a view to ascertaining the relative value of the aphelinid parasite *E. formosa* as a factor in the control of the whitefly in Michigan greenhouses. Parasitism of 91 percent of the whitefly on fuchsia and 86 percent on tomato was the greatest control observed during the course of experiments conducted. The highest percentage of parasitism of the whitefly on the majority of plants was reached under nearly constant temperatures of 75°–79° F. and 50–70 percent relative humidity. Widely fluctuating temperatures between 57°–81° gave somewhat higher percentages. The parasite, however, accomplished very little control at temperatures of 64° or below, because at such temperatures it was sluggish. The data and observations here recorded show that if the percentage of parasitism is any indication of the optimum conditions of the parasite, the optimum temperature is lower than 30° C. (86° F.). "Of the physical environmental factors affecting the efficiency of the parasite, temperatures seems to be the most important. Other factors which appear to play an important part are humidity and light. The effect of such physical factors as character of the host plant is expressed by the degree of pubescence and the amount of excretion of both plant and whitefly larvae. . . . In other words, the degree of parasitism is affected by the pubescence of the host plant and by

the excretions of host plant and whitefly larvae. The parasite does not appear to restrict its oviposition activity entirely to the fourth instar. It has been observed attacking the second and third as well. Oviposition is, however, normally confined to the fourth instar. Even in an environment that seems most ideal for the parasite, and despite the fact that each generation is composed of 100 percent females in most cases (thelytoky), the biotic potential of the parasite is apparently unequal to that of its host, especially during heavy infestations. Where a variety of plants are grown together, therefore, it seems unlikely that complete control can be rendered by the parasite alone under normal greenhouse conditions. But, under favorable conditions and a large parasite population, *E. formosa* definitely checks the rapid increase of its host."

A list is given of 47 references to the literature.

Importation, rearing, and colonization of parasites of the oriental fruit moth. H. W. ALLEN, J. K. HOLLOWAY, and G. J. HÄUSSLER (*U. S. Dept. Agr. Cir. 561* (1940), pp. 62, figs. 15).—An account is given of the work of the Bureau of Entomology and Plant Quarantine from 1929 to 1935, inclusive, during which period a search was made for beneficial parasites of the oriental fruit moth in Europe, Australia, Japan, and Chosen (Korea). Seven beneficial species found in Europe, 2 of the 10 species found in Australia, and 17 of about 65 species found in Japan and Chosen were successfully imported and liberations made in the United States. Parasites secured directly from importations were supplemented by those propagated at the receiving station in New Jersey and by liberations of several indigenous species, including *Macrocentrus ancyliorvus*. One thousand and ninety-three separate liberations were made. These were well distributed throughout the infested area from Massachusetts to Michigan and southward to Georgia and Arkansas. Special attention is given to the technic of importing to prevent entry of undesirable species, to propagation and rearing at the receiving station, and to methods of shipping the adult parasites to insure delivery of vigorous stock at the liberation points, frequently several hundreds of miles from the place where the parasites were reared.

DN dusts on hops for control of the red spider. H. E. MORRISON and D. C. MORE. (Oreg. Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 4, pp. 614-619).—Following a historical review covering the common red spider as a hop pest, the results of control work conducted continuously from 1938 are reported. Preliminary tests in the field in 1938 favored the use of the proprietary 1 percent DN dust (dinitro-*o*-cyclohexylphenol). In experiments with this dust in 1939 very high kills were obtained from mechanical dilutions at concentrations "of 1, 0.75, 0.50, 0.25, 0.125, 0.0625, and 0.03125 percent. Talc, hydrated lime, bentonite, diatomaceous earth, Loro, rotenone, pyrethrum, and nicotine sulfate were found compatible with the proprietary 1 percent DN dust, but did not contribute to added toxicity. DN dusts were found safe on the foliage of 10 hop varieties, but caused severe injury to 2 Russian varieties (Serebrianka and Skorospelka). Mechanically diluted DN dusts were found safe on 4 varieties of beans. Promising results have been obtained in the development of suitable commercial means of contacting red spiders on the under surfaces of hop foliage."

ANIMAL PRODUCTION

[Livestock investigations in Alabama] (*Alabama Sta. Rpt. 1938*, pp. 11-14, 17).—Progress results (E. S. R., 81, p. 84) are briefly presented for the following lines of investigation: The value of peanut hay for wintering breeding cows and for fattening steers, kudzu as a grazing crop for beef cattle, shelter v. no shelter for fattening steers, returns secured from rough untillable land in the form of beef produced, and the transmission of factors related to the economical

production of swine, all by J. C. Grimes; the detection of infertile eggs previous to incubation, by D. F. King; and the value of kudzu and other summer green feeds for poultry, by G. J. Cottier and King.

[Investigations with livestock in Arizona] (*Arizona Sta. Rpt. 1939, pp. 55-59, 95, 96*).—Studies for which results are briefly noted include the nutritional value of range plants, the utilization of grain in hegarl silage by beef cattle, the relation between conformation of feeder steers and their feeding and slaughter efficiency, a comparison of rations for laying hens, and the effect of backcrossing and reciprocal crosses on egg production in the offspring.

[Livestock investigations in Georgia] (*Georgia Sta. Rpt. 1940. pp. 37, 39-47, 48-51, fig. 1*).—Experiments for which progress results are reported (El. S. R., 82, p. 804) include: The influence of fertilized pastures on the reproductive efficiency of dairy cattle, a comparison of peanut hay v. silage and of peanut meal v. cottonseed meal for fattening cattle, the value of peanuts and vines in cattle fattening rations, the winter feed requirements of the beef cattle breeding herd, the value of supplementary concentrates for young beef cattle and for dairy heifers on summer pasture, sweetpotato meal as a feed for fattening cattle, the effect of length of day on the breeding season of sheep, the use of Hampshire and Southdown rams for improving the lamb- and wool-producing quality of native sheep, the utilization of peanuts and peanut meal for swine feeding, corn v. wheat for hogs, and the influence of pasture fertilization on the growth and development of young mules.

[Livestock investigations in Mississippi] (*Miss. Farm Res. [Mississippi Sta.], 3 (1940), No. 8, pp. 3-5, 8, figs. 6*).—The results of experiments with livestock are reported in articles entitled A Study of the Influence of Breeding Upon Performance Under Mississippi Conditions—The Production of Beef Calves, by A. El. Cullison; and Green Grass Best for Calves: Codliver Oil a Substitute, by W. C. Cowsert.

Composition and utilization of range vegetation of Sutton and Edwards Counties, G. S. FRAPS and V. L. COY (*Texas Sta. Bul. 586 (1940), pp. 39*).—Analyses of 849 samples of range vegetation and a study of the kinds of vegetation eaten by cattle, sheep, and goats indicated that the forage supplied sufficient quantities of lime (calcium). The protein was probably insufficient in the rations of the cattle in February, March, April, and November of the years studied. The protein was probably insufficient in the rations of the sheep and goats only in 1 mo. (November) of the period studied. The phosphoric acid was probably insufficient in the ration of the cattle from September through February, that of the sheep in December 1930, January 1931, and from September to December 1931, and that of the goats was probably deficient from October 1930 through February 1931 and October, November, and December 1931.

The composition of grass at various stages of maturity, and the changes occurring during haymaking, with particular reference to carotene-content, F. E. MOON (*Empire Jour. Expt. Agr., 7 (1939), No. 27, pp. 225-234, figs. 2*).—A study was made at King's College, Newcastle, of the carotene content and organic constituents in a mixed meadow herbage at approximately 2-week intervals from April to July. The carotene content was depressed by an April drought, then remained about constant until flowering began, when a marked loss occurred. No further decrease during the postflowering period was observed, although dry matter increased during this period. A loss of about 50 percent of the carotene in mown grass occurred during 4 days in the swath under unfavorable weather conditions. Little additional loss occurred during the subsequent 6 days under more favorable curing conditions.

The carotene-contents of some grass and clover species, with a note on pasture weeds, F. E. MOON (*Empire Jour. Expt. Agr., 7 (1939), No. 27, pp.*

235-243).—Data are reported on the carotene content at various stages of growth of seven grasses and three clovers. In spring the carotene content was closely related to growth activity, while in summer it depended largely on the stage of maturity. During the summer the clovers and also grassland weeds were superior to the grasses as a source of carotene. In the fall carotene content generally increased unless plants were in an advanced stage of maturity or when growth ceased for any reason.

Silage from hay crops: Making it—feeding it, S. T. DEXTER and C. F. HUFFMAN (*Michigan Sta. Cir.* 173 (1940), pp. 8, figs. 3).—The discussion deals with crops suitable for silage production, stage of maturity for harvesting and desirable moisture content, methods of handling the crop, the use of preservatives, and practical feeding recommendations.

Production, handling, and feeding sorghum silage by use of the trench silo, W. N. McMILLEN, C. H. JAMISON, and W. LANGHAM ([*Oklahoma*] *Panhandle Sta., Panhandle Bul.* 66 (1940), pp. [2]+II+23, figs. 8).—A practical discussion of the relative merits of silage v. dry feed, sorghum crops suitable for silage production, the location and construction of the trench silo, filling the silo, and feeding recommendations for various classes of livestock.

[Sixteenth and seventeenth annual reports of the activities of the National Live Stock and Meat Board for the fiscal years 1938-39 and 1939-40], R. C. POLLOCK (*Natl. Livestock and Meat Bd. Ann. Rpts.*, 16 (1939), pp. 115, figs. 65; 17 (1940), pp. 88, figs. 62).—Included in these reports are progress statements of the cooperative meat investigations being conducted by State experiment stations and the U. S. Department of Agriculture.

A study on the preservation of meats by cold storage, A. VALENZUELA and M. D. SUMULONG (*Philippine Jour. Anim. Indus.*, 6 (1939), No. 6, pp. 459-466).—Data are presented on the chemical composition of beef, Indian buffalo, and carabao meats in the fresh state and after chilled or frozen storage for varying periods. The slight changes in composition and in flavor, aroma, and texture of meats due to cold storage indicated that the nutritive value and palatability of meats were not impaired during 3 months at 38° F. or up to 13 months at from 18° to 22°. Good sanitary precautions during the preparation of meat for storage and humidity control during storage also proved to be important considerations in maintaining meat quality.

Calves from cows compared with calves from heifers, P. GERLAUGH (*Ohio Sta. Bimo. Bul.* 205 (1940), pp. 123, 124).—A record of the gains made by cows' calves and heifers' calves in two fattening trials, each of 308 days' duration, showed no significant difference in the rate of gain for the two groups.

Hybrid versus open-pollinated corns for fattening steer calves, P. GERLAUGH (*Ohio Sta. Bimo. Bul.* 205 (1940), pp. 124, 125).—In a feeding trial with steer calves extending over 308 days hybrid corn (mixture of four hybrids) and open-pollinated corn (mixture of four varieties) were compared. The protein concentrate mixture, hay, and silage portions of the ration were identical for the two groups. The slight advantage of the group receiving hybrid corn over the group fed open-pollinated corn both in average rate of gain and in the amount of feed required per unit of gain was not considered significant.

Iron-treated cottonseed meal for steer calves, P. GERLAUGH (*Ohio Sta. Bimo. Bul.* 205 (1940), pp. 125, 126).—In a feeding trial of 308 days' duration comparing linseed meal, hydraulic cottonseed meal, and hydraulic cottonseed meal plus 2 lb. of ferrous sulfate per hundredweight as protein supplements for fattening steer calves, the rate and economy of gains were practically identical for the three lots, indicating that the addition of iron to cottonseed meal does not enhance its feeding value for this type of animal.

Adding supplement to corn for calves on pasture, P. GERLAUGH (*Ohio Sta. Bmo. Bul.* 205 (1940), pp. 127-130).—In a further report of this series of experiments (*E. S. R.*, 77, p. 525), a summary of the results of these trials to determine the value of adding cottonseed meal to a corn and pasture ration for beef calves indicated that calves receiving the cottonseed meal supplement made average daily gains of 1.79 lb. and required 569 lb. of corn and 56 lb. of cottonseed meal per 100 lb. of gain, while those receiving no supplement gained at the average rate of 1.63 lb. daily and required 649 lb. of corn per 100 lb. of gain. In all trials the calves receiving the supplement were equal or superior to the calves receiving only corn while on pasture.

Coast disease in Western Australia, H. W. BENNETTS (*Jour. Dept. Agr. West. Austral.*, 2. ser., 17 (1940), No. 1, pp. 41-48).—Experimental evidence was obtained to indicate the identity of coast disease of sheep and cattle in Western Australia with that of South Australia (*E. S. R.*, 80, p. 107) and to be due to a dual deficiency of copper and cobalt. The administration of salts of copper and cobalt as a lick, as a drench, or in the drinking water proved highly effective in preventing the onset of this disorder.

Meat qualities in the sheep, with special reference to Scottish breeds and crosses, II, H. PÁLSSON (*Jour. Agr. Sci. [England]*, 30 (1940), No. 1, pp. 1-82, pls. 11, figs. 9).—Continuing this report (*E. S. R.*, 82, p. 523), data are presented on a comparative study of the anatomical composition and characters of the different breeds and crosses previously described. The material for this study was provided by the complete anatomical dissection of 11 wether lambs and 5 yearling wethers selected as representative. In both groups the study confirms the findings resulting from the statistical comparisons based on carcass measurements of the same breeds and crosses at constant weight. Breed differences in the relative development of the different regions of the body and of the major tissues in different joints and in total carcass and also the concept of early and late development as a fundamental factor in meat production are emphasized. The comparison of lambs and yearlings showed that in the total carcass bone had increased least, muscle only slightly more, and fat most during the increase in age from 4.5 to 13 mo. Variations in the number of vertebrae in the different anatomical regions and other anatomical differences are described and illustrated. The relationship of the many factors and principles involved in this study to practical problems in lamb and mutton production are discussed at length.

The merits of Rambouillet sheep, R. F. MILLER (*Univ. Calif.*). (*South-west. Sheep and Goat Raiser*, 10 (1940), No. 6, pp. 19, 22).—A summary of research previously noted (*E. S. R.*, 75, p. 92).

Studies indicate that trucking sheep from winter to summer range has many advantages over trailing, A. D. SMITH (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 3, p. 7).—Comparative data on liveweight losses sustained by flocks trailed or trucked from winter to summer range showed that both ewes and lambs, particularly the latter, lost considerably more weight under the former method. Later weights indicated that the lambs moved on foot subsequently grew at a slower rate, indicating that trail losses may be permanent.

Fattening lambs on Oregon feedstuffs, D. E. RICHARDS (*Oregon Sta. Bul.* 370 (1940), pp. 24, figs. 3).—The results of trials comparing both roughages and grain feeds of local origin for fattening lambs are reported. Chopped alfalfa hay (second cutting) proved much superior to wild hay, barley hay, or alsike clover straw when each was fed with barley as a concentrate. The addition of carrots to the barley hay and grain ration markedly improved the value of this feed mixture. A roughage composed of one-half chopped alsike straw and one-half chopped alfalfa, while inferior to straight alfalfa, promoted satisfactory

gains and provided a satisfactory method of utilizing the straw. Chopping alfalfa hay proved profitable, reducing the feed requirement per unit of gain and increasing the rate of gain and dressing percentage of lambs as compared with long hay. Pea-vine silage could be used to good advantage, best results being obtained when 1 lb. of chopped alfalfa per head daily was fed as the supplement to the silage and barley ration. Wheat gave somewhat better results than barley which, in turn, was superior to oats as a grain supplement. Grinding grain for lambs was not a profitable practice. Alsike clover screenings, when added to the alfalfa-grain ration, improved the rate of gain. In general, about 200 lb. of alfalfa hay and 100 lb. of grain were required to convert a thin feeder lamb into a good market lamb in about 90 days.

Self-feeding vs. hand-feeding fattening lambs and rations for self-feeding lambs. G. A. BROWN and L. H. BLAKESLEE (*Michigan Sta. Spec. Bul.* 303 (1940), pp. 27, figs. 6).—The results of a series of feeding trials, involving 10 different feeding practices or combinations of feeds with a total of 1,091 feeder lambs, are summarized on the basis of rate and economy of gain over each of three 28-day experimental feeding periods and for the entire 84-day fattening period used in each trial. When alfalfa hay and shelled corn were self-fed v. hand-fed, the rate of gain was similar under the two systems with 44 percent hay and 56 percent corn comprising the ration in the former case and 54 percent hay and 46 percent corn in the latter. With hay priced at \$5, \$7.50, \$10, and \$12.50 per ton self-feeding proved more economical than hand-feeding when corn was worth not more than 42, 56, 71, and 85 ct. per bushel, respectively. Shelled corn and long alfalfa hay gave more economical gains than cracked corn with cut or ground alfalfa, although death losses were somewhat higher on the long hay. Cut hay was generally less satisfactory than ground hay. The use of linseed cake as a supplement to corn and alfalfa increased the rate of gain and decreased the death losses, though not sufficiently to justify its use economically. Free-choice feeding of corn, oats, bran, and linseed cake resulted in relatively more costly gains due to the heavy consumption of the linseed cake. Corn-and-cob meal and alfalfa hay promoted slightly slower gains than shelled corn and alfalfa or a mixture of shelled corn and ground alfalfa (8:2) plus alfalfa hay. Oat hulls had only about one-half the value of ground alfalfa as a bulking agent in the self-fed ration.

Cottonseed meal, hegari, and alfalfa hay for the fattening of lambs. P. E. NEALE (*New Mexico Sta. Bul.* 272 (1940), pp. 14, figs. 2).—A ration of alfalfa hay and hegari grain was compared with ground hegari fodder and hegari grain supplemented with varying amounts of cottonseed meal as rations for fattening lambs. Approximately 20 lambs per lot were fed for 83 days in trial 1 and 98 days in trial 2, with roughage fed ad libitum and approximately 0.95 lb. of concentrates allowed per head daily in all cases. The addition of 0.35–0.5 lb. of cottonseed meal per head daily to the fodder ration gave average gains closely approaching those on the alfalfa ration and at a lower cost per unit of gain than when smaller or larger amounts of cottonseed meal were fed. It is concluded that at least 0.35 lb. of cottonseed meal per head daily should be fed when ground hegari fodder is the only roughage, and that good alfalfa hay without a protein supplement is a better roughage for fattening lambs than hegari fodder supplemented with any amount of cottonseed meal.

Swine production. F. H. REED and H. E. WILSON (*Canada Dept. Agr. Pub.* 686 (1940), pp. 56, figs. 23).—A popular publication dealing with breeds and breeding and the feeding and management of swine under western Canadian conditions. The material is based, in the main, on results of experiments conducted at the Lacombe (Alta.) Station.

Initial trials with dried whey powder in rations for pigs, A. R. CALLAGHAN and V. R. McDONALD (*Jour. Dept. Agr. So. Austral.*, 43 (1940), No. 8, pp. 584-595, fig. 1).—A series of feeding experiments compared the following four rations for bacon pigs: (1) Wheat and skim milk, equal parts, 289 lb.; (2) wheat 373, meat meal 31.5; (3) wheat 363, dried whey 34; and (4) wheat 289, meat meal 24.5, dried whey 27 lb. Average daily gains per pig were 1.64, 1.21, 1.32, and 1.49 lb., and the amounts of dry matter consumed per pound of gain were 2.51, 3.58, 3.23, and 2.95 lb. It is concluded that the addition of dried whey to wheat-meat meal mixtures will materially improve the efficiency of the ration and go far in providing a satisfactory substitute for skim milk. It appeared that under South Australian conditions the dry matter requirement for growing pigs is substantially lower than that recommended in commonly accepted feeding standards.

The function of nitrate, nitrite, and bacteria in the curing of bacon and hams, J. BROOKS, R. B. HAINES, T. MORAN, and J. PACE ([*Gt. Brit.*] *Dept. Sci. and Indus. Res., Food Invest., Spec. Rpt.*, 49 (1940), pp. VIII+32, figs. 2).—Based on the results of a series of experiments as described, the conclusion is reached that the characteristic cured flavor of bacon is due primarily to the action of nitrite on the flesh and that a satisfactory flavor can be produced by using only sodium chloride and sodium nitrite in the curing pickle. A satisfactory color and flavor was obtained with a relatively low nitrite content of the order of 10 p. p. m. in the lean tissue. The presence of nitrate or microbial action during curing did not prove essential for the development of bacon flavor. Advantages claimed for the direct use of nitrite in curing bacon included greater control of nitrite content in the finished product; greater latitude in the composition of the tank pickles to permit control of pH and the use of various flavoring ingredients; and a reduction in the microbial population on the surface, making possible a bacon that would keep better.

The use of tomatoes and tomato products in feeding fur animals, S. E. SMITH. (U. S. D. A., Cornell Univ., et al.). (*Amer. Fur Breeder*, 13 (1940), No. 2, pp. 26, 27, fig. 1).—A brief progress report.

A deficiency disease of foxes, R. G. GREEN and C. A. EVANS. (Univ. Minn. et al.). (*Science*, 92 (1940), No. 2381, pp. 154, 155).—A further description of a nutritive disorder, previously reported (*E. S. R.*, 80, p. 336), which commonly occurs among foxes in captivity receiving 10 percent or more of fish in the diet and is apparently due to vitamin B₁ deficiency. Pathologically this disorder is the counterpart of Wernicke's disease or hemorrhagic polioencephalitis of man.

The effect of controlled culling of chickens on the efficiency of progeny tests, I. M. LERNER and L. W. TAYLOR. (Calif. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 60 (1940), No. 11, pp. 755-763).—A population of White Leghorn pullets, including at least 50 daughters from each of 12 sires, was used in this study. The production and mortality of the progeny of the different sires over the first laying year are presented. A number of culling systems were applied to these data, including paper culling of 12, 18, 24, 30, and 36 percent of each family at the end of the laying year, and 12, 18, and 24 percent of each family in 3, 4, or 6 controlled cullings during the year. Based on statistical analyses of these data, it is concluded that when annual egg production and livability are the gross desiderata considered paper culling at the end of the year is of questionable value, and that no system of culling investigated gave greater differentiation between matings than the system used in calculating the production index (*E. S. R.*, 80, p. 472). Controlled cullings as used enhanced the possibility of selecting superior sire families but at the same time decreased the precision in eliminating inferior families. Marked economies could be

effected by culling both in savings of feed and in conversion into meat of a large number of birds that would have died during the first laying year.

A statistical study of seasonal variation in the egg production of White Leghorn and Rhode Island Red chickens. R. G. MARTIN (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 1, pp. 45-52, figs. 2).—An analysis of annual egg production records for the above-mentioned breeds over a 9-yr. period gave evidence that egg production followed a definite cycle under Philippine conditions, gradually rising from October to a peak in March and then gradually decreasing to a minimum in August. Maximum production was attained during the dry season, and minimum production during the wet season. A high positive coefficient of correlation was found to exist between annual egg production and that during the wet season, indicating the value of such short-time records for detecting good layers.

Summer management of pullets. D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul.* 205 (1940), pp. 119-121, fig. 1).—Practical suggestions are offered, with stress on the importance of adequate space in the brooder house, the value of isolated range for chicks and growing pullets, and the desirability of pasture as a part of the ration for growing birds.

Lability of metabolic processes in laying hens. C. F. WINCHESTER. (Mo. Expt. Sta.). (*Poultry Sci.*, 19 (1940), No. 4, pp. 233, 234, fig. 1).—A partial report of research noted from another source (*E. S. R.*, 83, p. 672).

Seasonal metabolic rhythms in the domestic fowl. C. F. WINCHESTER. (Mo. Expt. Sta.). (*Poultry Sci.*, 19 (1940), No. 4, pp. 239-245, figs. 4).—A further report of research as noted above.

The utilization of food elements by growing chicks.—IX, The nitrogen of urea. C. W. ACKERSON, W. E. HAM, and F. E. MUSSEHL (*Nebraska Sta. Res. Bul.* 120 (1940), pp. 7).—Continuing this series of investigations (*E. S. R.*, 82, p. 664), the effect of substituting a mixture of starch and urea for one-third of the protein concentrates in the basic ration on an equivalent nitrogen basis was determined in a growth and body-analysis experiment with day-old chicks. Chicks receiving urea gained at a slower rate and retained 12 percent less of the total nitrogen ingested than the control chicks. While the gain per gram of nonurea nitrogen fed was slightly greater in the urea-fed lot than in the control lot, it appeared that urea nitrogen was not utilized by chicks up to 6 weeks of age.

The ability of citrulline to replace arginine in the diet of the chick. A. A. KLOSE and H. J. ALMQUIST. (Univ. Calif.). (*Jour. Biol. Chem.*, 135 (1940), No. 1, pp. 153-155).—Continuing this line of investigation (*E. S. R.*, 80, p. 89), the authors found that the addition of 1 percent arginine hydrochloride or 1 percent citrulline (prepared from ornithine) to a basal diet containing 20 percent casein promoted much more rapid gains in young chicks than were obtained on the basal diet alone or on the basal plus 1 percent ornithine. Citrulline was fully equal to arginine in this respect.

The complex nature of the alcohol precipitate factor required by the chick. A. E. SCHUMACHER, G. F. HEUSER, and L. C. NORRIS. (Cornell Univ.). (*Jour. Biol. Chem.*, 135 (1940), No. 1, pp. 313-320, fig. 1).—In a further report of these investigations (*E. S. R.*, 82, p. 667), evidence is presented to indicate the requirement of the chick for two growth factors distinct from other factors now recognized as essential in chick nutrition. These two factors were found to be present in large amounts in dried yeast. Both were extracted with 0.24 N hydrochloric acid solution and separated by alcohol precipitation upon adjustment of the pH. One fraction, designated as factor R, was soluble in acid alcohol, while the other, factor S, was precipitated in this solution. Factor R was further purified by neutralization of the acid alcohol filtrate to give a neutral alcohol

precipitate. Either fraction, when added to the basal diet, stimulated more growth than was obtained on the unsupplemented diet but less than was obtained on a combination of the two factors in the diet. The possible identity of one of these factors and factor U of Stokstad and Manning (E. S. R., 80, p. 814) is suggested.

The effect of differing mash levels of alfalfa leaf meal in enhancing hatchability (*Rhode Island Sta. Rpt.* [1939], pp. 53, 54).—A further progress report (E. S. R., 81, p. 827).

A breed difference in the manganese requirement of laying hens, W. V. GOLDING, P. J. SCHABLE, and J. A. DAVIDSON. (*Mich. Expt. Sta.*). (*Poultry Sci.*, 19 (1940), No. 4, pp. 263-269, fig. 1).—In an experiment of 8 months' duration, two pens of White Leghorn pullets receiving the same basal ration but containing 9 and 50 p. p. m. of manganese, respectively, laid at 33- and 39-percent levels, with eggs having hatchabilities of 74.6 and 75.9 percent, respectively. No chondrodystrophy occurred in chicks from either group. In a second trial involving both White Leghorn and Barred Rock layers, the hatchability of Barred Rock eggs on each of two low-manganese basal rations was 59.7 and 58.7 percent as compared with hatchabilities of 81.3 and 81.6 percent when manganese supplement was added. As in the first trial, White Leghorns on the low-manganese diet produced eggs of approximately 75 percent hatchability, and the addition of manganese supplement improved hatchability but slightly. Chondrodystrophy was almost entirely confined to the Barred Rocks on the unsupplemented ration. It appeared that Barred Rocks were definitely more sensitive to a lack of manganese than the White Leghorns, and further that a manganese supplement to practical laying and breeding rations was desirable in the case of the former breed.

The influence of elemental sulphur upon chick growth and bone ash, O. E. GORF and C. W. UPP. (*La. Expt. Sta.*). (*Poultry Sci.*, 19 (1940), No. 4, pp. 270-280, fig. 1).—Continuing the studies on the effects of sulfur in the chick diet (see p. 106), seven trials were conducted in which various levels and sources of sulfur were included in the diet along with supplements of cod-liver oil, molasses, and charcoal. The addition of 0.25 percent cod-liver oil (400 or more A. O. A. C. units of vitamin D) to rations containing from 0.5 to 5 percent commercial flour sulfur failed to promote normal bone calcification and growth in chicks to 8 weeks of age when confined in the absence of sunlight. Increasing the cod-liver oil to 0.5 percent from 8 to 12 weeks improved the rate of growth and generally prevented leg weakness, although bone ash values were below normal. In the presence of 0.5 percent cod-liver oil, greater gains were consistently obtained with 5 percent than with 2 percent or no commercial flour sulfur in the ration. However, with micronized sulfur or flowers of sulfur, better gains were obtained at 2- than at 5-percent levels. When over 4 percent sulfur was fed, best gains were obtained with the commercial flour sulfur, followed in order by 325-mesh sulfur, micronized sulfur, and flowers of sulfur, while at lower levels of intake results were similar except that flowers of sulfur gave greater gains than the micronized product. The addition of molasses or charcoal to the rations containing sulfur generally reduced the rate of growth, suggesting that the various sulfurs may not be compatible with these ingredients in chick rations.

Some observations on feeding dyes to laying chickens, C. A. DENTON. (*U. S. D. A.*). (*Poultry Sci.*, 19 (1940), No. 4, pp. 281-285).—Twenty-four dyes, including 9 water-soluble and 15 alcohol-soluble ones, were administered to laying pullets after egg yolk color had been depleted on a low pigment ration. The dyes were fed in capsules generally at the rate of 20 mg. per bird daily. All of the water-soluble and 8 of the alcohol-soluble dyes failed to be deposited in any part of the egg, while 7 of the alcohol-soluble ones were deposited in the yolk with varying

degrees of intensity. Color appeared in the yolk from 2 to 3 days after first feeding of the dyes, and in most cases yolk color diminished rapidly after dye feeding was discontinued. One dye, Hexyl Blue, stained all abdominal and external fat, and color was imparted to the egg yolk for an extended period after feeding was discontinued, indicating that this particular dye was withdrawn from body-fat depots and deposited in the yolk.

Some factors affecting variations in egg shell quality, L. A. WILHELM (Wash. Expt. Sta.). (*Poultry Sci.*, 19 (1940), No. 4, pp. 246-253, figs. 3).—Data were recorded on the egg weight, dry weight of shell, percentage of shell, and shell thickness of eggs produced by an experimental flock of 40 White Leghorn pullets over a complete laying year (13 28-day periods). No significant difference was found to exist in egg weight or shell thickness between hens laying more than or less than 200 eggs during the year, indicating that shell thickness and rate of production are independent of each other. Also, there was only a slight decrease in shell thickness between the first and last egg laid in clutches of 1, 2, 3, or 4 eggs. A definite seasonal variation in shell thickness was definitely correlated with temperature, maximum thickness occurring in winter and minimum in midsummer. Shell thickness was significantly correlated with dry weight of shell and percentage of shell and was not independent of egg weight.

Percentage shell as a function of shell thickness, egg volume, and egg shape, V. S. ASMUNDSON and G. A. BAKER (Univ. Calif.). (*Poultry Sci.*, 19 (1940), No. 4, pp. 227-232, figs. 3).—Data are presented on the weight and length-breadth index of whole eggs, the density of egg and of shell, and the weight and thickness of shell for eggs of ring-necked and silver pheasants, chickens, and turkeys. Ring-necked pheasant eggs had thinner shells than chicken eggs, which in turn were thinner shelled than the turkey or silver pheasant eggs. Analysis of the data indicated that at a constant shell thickness the shape of the egg had a negligible effect on the percentage of shell, although it decreased slightly with increasing relative breadth of the egg. However, the percentage of shell decreased significantly as volume or size of the egg increased. Within a species it was found that shell thickness had three times as great an effect in the opposite direction as the same relative change in volume on the relative change in shell percentage.

Dysfunction of the biliary system and hemorrhages in the gizzard of the chicken, A. I. LANSING and D. MILLER (U. S. D. A.). (*Poultry Sci.*, 19 (1940), No. 4, pp. 258-262).—The results of 4 separate experiments are summarized. In a test with adult fowls the hepatic and cystic bile ducts were ligated in 4 birds and only the cystic duct in 3 others. From 5 to 21 days after this operation examinations revealed the presence of newly developed hemorrhages in the gizzards of 6 of the 7 birds. Examination of the bile system and gizzards of 85 1- and 2-day-old chicks showed considerable variation in the size of the gall bladders, and in 63 cases in which the cystic ducts contained no bile the severity of gizzard hemorrhages and erosions of their gizzards was much higher than in the 22 birds in which bile was present in the ducts, suggesting a relationship between gizzard hemorrhages and failure of the bile to pass from the gall bladder. Cholecystographic examinations of from 1- to 6-day-old and 3-week-old chicks tended to confirm this finding. A study of the effect of various feedstuffs on the biliary system revealed that when feed was withheld from chicks for 2 days the gall bladders were filled with dark-green bile and the ducts were generally emptied, as was the case when birds received singular feedstuffs, as casein, corn oil, or cornstarch for 7 days. Chicks receiving a normal diet for 4 days or more generally had flaccid gall bladders containing clear pale-green bile and the ducts contained bile.

Turkey production in Missouri, T. W. NOLAND (*Missouri Poultry Sta. Bul.* 41 [1940], pp. 17, figs. 8).—A practical handbook on the management of the turkey breeding flock, the production and incubation of eggs, the feeding and management of growing turkeys, and common turkey diseases.

DAIRY FARMING—DAIRYING

List of sires proved in dairy herd improvement associations, 1940 (*U. S. Dept. Agr., Misc. Pub.* 393 (1940), pp. 240).—The present publication, which is the fourth list of the series (*U. S. R.*, 82, p. 95), contains the names and summarized records of 3,183 sires whose records have been tabulated recently.

The value of sodium metaphosphate in detergent mixtures in the cleaning of milking machines, W. L. MALLMANN and C. S. BRYAN. (*Mich. Expt. Sta.*). (*Jour. Dairy Sci.*, 23 (1940), No. 7, pp. 621-627).—Surveys of milk supplies from producers using milking machines gave evidence of relatively high average bacteria counts, particularly where field inspection was inadequate. In controlled experiments in which normal machine cleaning methods were compared with cleaning with a detergent containing 20 percent sodium metaphosphate, the latter method prevented the formation of milkstone on both metal and rubber parts of the machine, while the control machines were heavily coated with milkstone. Milk of lower bacteria count was produced with the machines free from such deposits.

Contamination of milk from internal and external sources, L. W. JONES (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 3, pp. 8, 9, fig. 1).—A general discussion, indicating that contamination can practically be eliminated by keeping the cow clean, using a narrow-topped pail, sterilizing equipment, and adequate cooling.

Cooling milk at the farm, with special reference to modern electric milk coolers, J. E. NICHOLAS. (*Pa. State Col.*) (*Milk Plant Mo.*, 29 (1940), No. 7, pp. 23-27, figs. 8).—Data are presented on the rate of cooling of milk at different levels in a 10-gal. can when the can is submerged in the cooling medium. These data emphasize the importance of submerging the can below the milk level and of low temperature and agitation of the cooling medium to insure rapid and uniform cooling of the milk. The cooling of milk over a 50° F. range was accomplished in an electric milk cooler with an expenditure of energy of only slightly more than 1 kw.-hr. per 10-gal. can.

Old and new bacteriological analyses, E. G. HASTINGS. (*Univ. Wis.*), (*Amer. Milk Rev.*, 2 (1940), No. 4, pp. 82, 83, 88).—A critical comparison of the old and new standard methods for milk analysis in which the value of the newly adopted method is questioned.

Lipolysis in raw milk: Influence of homogenization temperature, I. A. GOULD. (*Mich. State Col.*). (*Indus. and Engin. Chem.*, 32 (1940), No. 6, pp. 876, 877, fig. 1).—Mixed herd samples of raw milk were heated to temperatures of 70°, 105°, 115°, 125°, 135°, and 145° F., then homogenized at 1,500-lb. pressure and cooled to 40°. Subsamples were then prepared, one of which was immediately pasteurized to prevent further lipolysis, the other held for 72 hr. and then pasteurized. Titration of purified fat samples from the various lots of milk for free fatty acids gave evidence that the heated samples underwent lipolysis in every case, with maximum fat splitting occurring within the temperature range from 105° to 125°. Samples homogenized at 70° showed only slight fat splitting, and temperatures of from 135° to 145° inhibited but did not entirely prevent lipolysis accelerated by homogenization.

A review of oxidation in milk and milk products as related to flavor, W. C. BROWN and L. M. THURSTON. (W. Va. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 7, pp. 629-685).—A comprehensive review with 412 references to the literature.

Oxidized flavor in milk.—II, The relation of oxidation-reduction potentials to its development, A. M. SWANSON and H. H. SOMMER. (Univ. Wis.). (*Jour. Dairy Sci.*, 23 (1940), No. 7, pp. 597-614, figs. 8).—Continuing these investigations (E. S. R., 83, p. 392), studies were conducted on the effect of various catalysts and antioxidants on the oxidation-reduction potential and flavor of pasteurized milks. The addition of copper to whole milk, skim milk, or cream was followed by a marked increase in oxidation-reduction potential and a subsequent development of oxidized flavor, the intensity of this flavor being greater in cream than in whole or skim milk. Approximately 10 times as much ferrous iron as copper was required to produce the same intensity of off-flavor in milk, and the presence of the iron caused oxidation-reduction potential to decrease. Ferric iron in milk caused a slow increase in oxidation-reduction potential but induced little or no oxidized flavor. Either crystalline ascorbic acid or crystalline *D*-isoascorbic acid when added to milk lowered the oxidation-reduction potential. The former inhibited the development of oxidized flavor, but the latter had little effect in this respect. Also passing electric current through the milk lowered the oxidation-reduction potential but failed to inhibit oxidized flavor. It is concluded that the Eh of the medium did not accelerate or inhibit the development of this off-flavor.

The relation of metals and their alloys to the flavor of milk, C. L. ROADHOUSE. (Univ. Calif.). (*Amer. Milk Rev.*, 2 (1940), No. 5, pp. 106, 107).—A summary of research previously noted (E. S. R., 83, p. 393).

Cream neutralization, N. E. FABRICIUS. (Iowa State Col.). (*Amer. Butter Rev.*, 2 (1940), No. 6, pp. 202-204, fig. 1).—A comprehensive discussion of the purposes of and proper procedures for this operation in buttermaking.

The relationship between the melting time of butterfat and its melting point, W. D. GALLUP and A. H. KUHLMAN. (Okla. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 7, pp. 593-595, fig. 1).—Employing the method previously described (E. S. R., 78, p. 151), further data have been obtained which confirm the previous finding that the melting time of butterfat is roughly proportional to its melting point. By means of a curve the melting time of butterfat samples may be closely approximated from melting point determinations.

The effects of various feeds on the milk fat constants and on the flavor and texture of butter, F. H. HERZER, J. S. MOORE, and W. C. COWSEET (*Mississippi Sta. Tech. Bul.* 25 (1939), pp. 62, figs. 8).—The results of a series of experiments extending over a number of years and involving the use of many feeding stuffs are summarized. A preliminary comparison of the physical and chemical characteristics of butter originating in Mississippi and in Minnesota showed the melting point and the heat resistance of Mississippi butter to be consistently higher than that of Minnesota butter. The refractive index and the Reichert-Meissl and iodine numbers of Mississippi butter did not follow the decided seasonal trends of the Minnesota butter. Trials involving comparisons of alfalfa hay with Johnson grass, Bermuda grass, soybean, lespedeza, and Sudan grass hays showed no significant trends in the effect of these dry roughages on the quality of butter. Silage had a beneficial effect on butter texture, with corn silage and sorghum silage exerting similar effects. The inclusion of cottonseed hulls in the ration quickly increased the melting point and produced a hard gummy butter. Cottonseed meal and cottonseed oil in the ration raised the melting point, refractive index, and iodine number, and increased the firm-

ness and gumminess of the butter. Both products decreased the Reichert-Meissl number, particularly the latter. Extracted cottonseed meal did not increase the melting point or iodine number and, while increasing firmness, did not increase the gumminess of the butter. Soybean meal in combination with cottonseed meal largely counteracted the hard texture typical of butter produced under cottonseed meal feeding. The resulting butter was superior to that produced when either protein concentrate was fed singly. Cured sweetpotatoes in the ration gave a butter of high Reichert-Meissl number and low iodine number, a very firm texture, and pleasing flavor. Dried sweetpotato pulp gave a butter of low iodine number and a firm, hard dry texture. The predominance of the Jersey breed is considered a contributing factor to the firm butter typical of the area. It is pointed out that firmer butter, to a moderate degree, is desirable to the South in plant processing, in shipping, and on the consumer's table during the warm months.

The incubation test as an indication of the keeping quality of butter, H. B. NAYLOR and E. S. GUTHRIE (*New York*] *Cornell Sta. Bul.* 739 (1940), pp. 19).—Butters obtained from 10 churnings of sweet cream made under carefully controlled sanitary conditions in the laboratory and from 28 commercial churnings in 4 different creameries were subjected to the incubation test in an attempt to predict keeping quality. Both unsalted and salted samples were obtained from each churning. Flavor score, pH, and total and caseolytic bacterial counts were determined on both the salted and unsalted butters when fresh, after 7-14 days' incubation at 60° F., after 2-5 months' storage at 0°, and after 10 days at 60° following the cold storage. The tests proved fairly reliable in indicating the keeping quality of the sweet cream butters prepared in the laboratory. Unsalted and mildly salted butters had similar keeping qualities. Very little loss in flavor score occurred during any of the incubation periods. The pH of the salted sweet cream butter averaged somewhat lower than that of the unsalted lots, while in both lots pH remained practically constant throughout the observation period. The test was also fairly reliable in predicting keeping quality of the commercial butters, although some exceptions occurred. Loss in flavor score was accompanied by a decrease in pH during the incubation period for all samples of unsalted butter. The pH of the salted samples remained quite constant. It appeared that proteolytic Gram-negative rod types of bacteria were largely responsible for the deterioration of unsalted butters.

Factors affecting the quality of Limburger cheese made from pasteurized milk, M. W. YALE (*New York State Sta. Tech. Bul.* 253 (1940), pp. 28, figs. 5).—Following the method of manufacture commonly used for producing Limburger cheese from raw milk, experimental cheeses were made in July, August, and October from 10 lots of milk ranging in bacterial count from 400,000 to 90,000,000 per cubic centimeter. Forty lots of cheese comprising 172 1-lb. loaves were made from the raw milk or milk which had been heated to 145° F. for 0, 10, 15, 20, or 30 min. The cheeses were analyzed and graded for quality after suitable ripening periods. Either partial or complete pasteurization improved the quality of cheeses made from poor quality milk in July and August, but not the quality of cheeses made in October from better quality milk. Holding at pasteurization temperature for 30 min. gave as good results as any of the shorter holding periods. Cheese from pasteurized milk was generally milder in flavor than raw milk cheese. A more pronounced flavor usually occurred in pasteurized milk cheese when no starter was used. The grade of the cheese was sometimes, though not always, improved by the addition of from 0.05 to 0.1 percent of lactic starter. It is concluded that pasteurization of milk for the manufacture of Limburger cheese results in a product of uniformly good quality when the proper manufacturing method is followed.

Effect of heat and pH on the inactivation of rennin in whey, E. B. STRUBLE and P. F. SHARP. (Cornell Univ.). (*Jour. Dairy Sci.*, 23 (1940), No. 7, pp. 587-591, fig. 1).—Samples of clarified whey were treated with hydrochloric acid or sodium hydroxide to give a pH range from below 1.0 to 7.0. Commercial rennet extract was added to the whey samples which were then heated to temperatures of 120°, 130°, 145°, and 158° F. for 2, 6, 10, and 14 min. After heating and cooling, all samples were adjusted to pH 6.0-6.5, after which the milk-coagulating power of the whey was determined. The zone of maximum stability of the milk-coagulating power of the rennet when heated to 120° or above centered at pH 4.0. The pH inactivation curves were nearly symmetrical both above and below pH 4.0. Alterations of one pH unit included approximately the complete inactivation effect. It appeared that normal amounts of rennet can be inactivated by holding at 50° C. (122° F.) for 14 min. at pH 6.8 to 7.0.

Homogenization, C. D. DAHLE and C. M. MOSS. (Pa. Expt. Sta. et al.). (*Ice Cream Trade Jour.*, 36 (1940), No. 6, pp. 18, 19, 63-65, figs. 4).—Two rotary-type and one single-valve, pressure-type homogenizers were compared for the homogenization of ice cream mixes. Pressures of 750 lb. on the rotary-type machines and 2,000 lb. on the standard-type machines gave very similar results with reference to size of fat globules in the homogenized mix, the time required to obtain 90-percent overrun in freezing, and the texture score of the frozen product. The temperature rise of the product during homogenization varied as follows: Pressure machine (2,000 lb.), 5° F.; rotary No. 1 (750 lb.), 7°; and rotary No. 2 (750 lb.), 25°.

A comparative evaluation of an ice cream supply as it reaches the consumer, L. K. CROWE and P. A. DOWNS. (Nebr. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 7, pp. 615-620).—Samples of vanilla ice cream representative of 19 different plants were purchased on the open market in consumer-size packages and examined for weight, overrun, chemical composition, bacteria count, and flavor and body score. Reasons for the difference in price level, which ranged from 15 to 30 ct. per pint, were not apparent on the basis of these criteria. Only slight differences in average composition and score were evident for groups of samples averaging 15, 20, and 25 ct. per pint in cost. The average net weight was lowest for the 15-ct. lot and highest for the 25-ct. lot, but the quantities of total solids or calories purchased per unit cost favored the low-price samples. Calories per unit cost were materially greater in fountain-dipped packages than in the factory-filled cartons. It is suggested that studies of this nature carried out at intervals of 6 mo. or 1 yr. would tend to bring to the consumer a more uniform product and establish a sound basis for differences in price per unit quantity.

VETERINARY MEDICINE

American veterinary history, I-IV, B. W. BIERER ([Baltimore]: Author, [1940], vols. 1-4, pp. [129]).—This history of veterinary medicine in America is presented in four parts, each of which includes a list of references to the literature, a total of 374.

Handbook of histological and cytological technique, R. R. and S. H. BENSLEY (Chicago: Univ. Chicago Press [1938], pp. VIII+167).—The first part of this work, consisting of 5 chapters (pp. 1-30), deals with technics for the study of fresh tissues and the second part, consisting of 16 chapters (pp. 31-158), with technics for the study of fixed tissues. A list of 20 references to the literature and an index are included.

Clinical parasitology, C. F. CRAIG and E. C. FAUST (Philadelphia: Lea & Febiger, 1940, 2. ed., rev., pp. 772, figs. 244).—A thoroughly revised and enlarged edition.

Notes on the preparation of papers for publication in the *Journal of Hygiene and in Parasitology*, G. H. F. NUTTALL (*Parasitology*, 32 (1940), No. 1, pp. 1-7).

[Work in animal pathology by the Arizona Station] (*Arizona Sta. Rpt. 1939*, pp. 96, 97).—The work of the year (E. S. R., 82, p. 249) briefly referred to includes bacteriological studies on infectious keratitis in cattle and goats, plants poisonous to range livestock, the use of sodium iodide injections in the treatment of actinomycosis, derris root solution for control of common cattle grub larvae in cattle, and control of death losses in young calves brought in from ranges and placed on alfalfa pastures by the feeding of dry hay.

[Work with animal diseases by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1939]*, pp. 54-56).—The work reported upon (E. S. R., 81, p. 834) includes infectious coryza, infectious bronchitis, and autopsy examinations of fowl and swine.

[Contributions on animal pathology and parasitology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 12 (1939), No. 2, pp. 279-318, 335-366, figs. 12).—Contributions presented (E. S. R., 82, p. 817) include the following: The Use of Saponin Spore Vaccine for Inoculation Against Anthrax in South Africa, by M. Sterne, E. M. Robinson, and J. Nicol (pp. 279-302); Observations on the Life-History of *Bunostomum trigonocephalum*, a Hookworm of Sheep and Goats, by R. J. Ortlepp (pp. 305-318); and Recent Investigations Into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa, IX, by S. J. van der Walt and D. G. Steyn (pp. 335-366) (E. S. R., 80, p. 540).

Livestock poisoning by oat hay and other plants containing nitrate, W. B. BRADLEY, H. F. EPPSON, and O. A. BEATH (*Wyoming Sta. Bul. 241* (1940), pp. 20, figs. 2).—The many cases of poisoning in Wyoming during the past 5 yr. resulting from the ingestion of oat hay and straw, largely by cattle, led to the work here reported. High concentrations of potassium nitrate (salt-peter) were found to be the cause of the poisonous properties sometimes shown by oat hay and straw. "After the ingestion of one-fourth of a gram or more of saltpeter per pound of body weight, cattle develop sufficient methemoglobinemia to cause their death. This methemoglobinemia is probably produced by nitrite which is formed from the nitrate in the gastrointestinal tract. It has been found that sheep and horses may also be poisoned by forages containing high concentrations of nitrate, although practically all reported losses have been of cattle. Methylene blue in doses of 2 gm. per 500 lb. of animal injected intravenously, immediately counteracts the effect of this ingested nitrate by converting the methemoglobin into normally functioning hemoglobin. Other plants such as wheat, barley, sorghums, corn, and weeds may sometimes contain enough nitrate to be poisonous. The concentration of nitrate in the soil is one factor which determines the amount of nitrate in the plants. Whether this is the only factor is not known."

Nutlets of *Amsinckia intermedia* toxic to swine, horses, and cattle, E. C. McCULLOCH. (Wash. Expt. Sta.). (*Madroño*, 5 (1940), No. 6, pp. 202, 203).—Wheat screenings containing nutlets of *A. intermedia*, a plant which grows abundantly in grain fields in certain semiarid regions of Washington, Oregon, and Idaho, proved toxic to nine pigs, three horses, and one of three calves to which they were fed. Hepatic cirrhosis developed, the parenchymal cells of the liver being destroyed and replaced by connective tissue. In cattle and swine the condition is known locally as hard liver, in horses as walking disease because of their tendency to wander aimlessly. As a result of its toxic effect in certain limited regions, the raising of swine and horses has been largely abandoned. It is probable that sublethal poisoning is much more widespread, occurring in those areas where the species is only moderately abundant.

Studies in chronic selenosis, M. I. SMITH, R. D. LILLIE, E. F. STOHLMAN, and B. B. WILSTFALL (*U. S. Pub. Health Serv., Natl. Inst. Health Bul. 174* (1940), pp. V+49, pls. 3, figs. 6).—The several parts of this report deal with the chronic toxicity of naturally occurring food selenium, gastric acidity in chronic selenium poisoning, liver function and bile pigments in experimental chronic selenium poisoning, and selenium in the hair as an index of the extent of its deposition in the tissues in chronic poisoning.

A simple method for preparing antigenic substances from the typhoid bacillus, J. W. PALMER and T. D. GRELUGH (*Science*, 92 (1940), No. 2381, pp. 155, 156).—The authors applied to pneumococci and to dried typhoid bacilli (*Eberthella typhosa*) a method of extraction with concentrated phenol which dissolved associated proteins and left capsular polysaccharides in the residue. The polysaccharides soluble in phenol were similarly purified by fractional precipitation from phenol solutions by alcohol or glacial acetic acid. Applied to typhoid organisms this method yielded a substance, probably still crude in nature, which was highly antigenic in mice. The details of the method are given. The antigens obtained were found to be toxic.

The treatment of certain experimental anaerobic infections with sulfapyridine and with immune sera, and the problem of synergic action, D. W. HENDERSON and P. A. GOREE (*Jour. Hyg. [London]*, 40 (1940), No. 3, pp. 345-364).—In experiments with sulfapyridine administered against anaerobic infections, it was found to be an efficient prophylactic or therapeutic agent for use against intradermal infection with the strain of *Vibrio septique* that was selected for the test, whereas in intramuscular infection it is unreliable and saves only a relatively small proportion of animals. The strain of *Olostridium welchii* (type A) selected for test is not insusceptible to the action of this drug. "A significant degree of protection against intradermal infection may be obtained, however, only when a prophylactic dose of the drug is given. The drug is apparently without action against intramuscular infection with this strain. Under the particular experimental conditions sulfanilamide is much less effective than sulfapyridine against infection with either *V. septique* or *C. welchii*. There is no evidence that sulfapyridine given per os neutralizes the toxins of *V. septique* or *C. welchii* injected intravenously. It is possible to control infection with *V. septique* by antitoxin or antibacterial serum given at a time when sulfapyridine is of little use. *C. welchii* antitoxin has a marked therapeutic effect in infection with this strain of the organism, but sulfapyridine given only after infection is apparently without action on the course of the disease. In intradermal infection with *V. septique* the combined action of sulfapyridine and antitoxin or of sulfapyridine and antibacterial serum effects a saving in life much greater than would be expected if a mere summation effect was in question. A similar effect was observed in intramuscular infection provided the administration of the drug was sufficiently prolonged. No such synergic effect is produced by the combined action of antitoxic and antibacterial serum. In *C. welchii* infection the combined action of antitoxin and sulfapyridine produces a noticeable synergic effect, but the evidence on this point is less clearly defined. The pathogenesis of infection with spore-bearing anaerobes is discussed in relation to prophylaxis or therapy with chemotherapeutic agents, antitoxin, antibacterial serum, and combinations of such."

Anthelmintic activity of fresh pineapple juice, J. BERGER and C. F. ASENJO. (Univ. Wis.). (*Science*, 90 (1939), No. 2335, pp. 299, 300).—Living specimens of *Ascaris lumbricoides* and *Macracanthorhynchus hirudinaceus*, obtained from hog's intestines, were incubated at a temperature of from 35° to 40° C. with

pineapple juice freshly squeezed from a Cuban pineapple. At the end of 24 hr. both parasites were completely digested, while controls incubated in heat-inactivated pineapple juice and in saline solution were very lively and active. The results obtained indicate that the juice possesses enzymatic activity similar in nature to that of some *Ficus* latexes, and therefore there is some scientific basis for its use as an anthelmintic. Reference is made to the findings of B. H. Robbins,² A. J. Walti,³ and others that the enzyme ficin which they obtained from some of these latexes was the active agent responsible for the digestion of the parasites.

Anthelmintic inactivity of fresh pineapple juice in vivo, E. KUITUNEN-EKBAUM (*Science*, 91 (1940), No. 2358, pp. 240, 241).—The author reports upon observations which have failed to support the findings of Berger and Asenjo, as above noted, that fresh pineapple juice may be of value as an anthelmintic.

Anthelmintic activity of crystalline papain, J. BERGER and C. F. ASEÑO. (Univ. Wis.). (*Science*, 91 (1940), No. 2364, pp. 387, 388).—In continuing the studies noted above, the authors found a commercial preparation of papain (Merck) to possess strong worm-digesting activity. "A 0.7-percent solution of dried preparation of M/18 phosphate-phthalate buffer pH 5 digested *Ascaris lumbricoides* (obtained from hog intestines) almost completely in 17 hr., while a 0.07-percent solution also showed some activity. Since this preparation had been on hand several years, a fresh sample was analyzed and found to have approximately the same activity. *Macracanthorhynchus hirudinaceus* (from hog intestine) was not digested by a 0.7-percent solution of either of these papain preparations, but was digested by fresh pineapple juice."

The bacteria-free culture of a nematode parasite, R. W. GLASER (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 3, pp. 512-514).—An account is given of a method by which a bacteria-free culture of a nematode parasite may be obtained. Since by this method the parasitic nematode can be "grown on both liquid and solid media free from bacteria, it will be possible to study its nutritional and other requirements and to test the effects of various vitamins and hormones."

***Diplogynia americana*, a new species of cestode (Hymenolephidiidae) from the eastern little green heron (*Butorides virescens virescens* (Linn.))**, O. W. OLSEN. (Minn. Expt. Sta.). (*Amer. Micros. Soc. Trans.*, 59 (1940), No. 2, pp. 183-186, figs. 6).

Strains in *Giardia ondatrae* Travis 1939, P. C. WATERS, A. R. FIENE, and E. R. BROCKE. (Iowa Expt. Sta.). (*Amer. Micros. Soc. Trans.*, 59 (1940), No. 2, pp. 160-162, fig. 1).—A study of *G. ondatrae* of the small intestine of the muskrat (*Ondatra zibethica*) revealed strains with significant size differences but practically identical contours.

A pathogenic agent of the genus *Rickettsia* found in *Haemaphysalis bispinosa* Neumann from a deer in Cochinchina (Cochinchina) [trans title], J. MESNARD and C. TOUMANOFF (*Compt. Rend. Acad. Sci. [Paris]*, 210 (1940), No. 10, pp. 378-380).—The authors report upon a species of *Rickettsia*, pathogenic for the guinea pig, that was isolated from *H. bispinosa* taken from a deer (*Cervus (Rusa) unicolor* Cuv.) in Cochinchina.

Biochemical and serological studies of microorganisms of the *Salmonella cholerae-suis* group, D. W. BRUNER and P. R. EDWARDS (*Kentucky Sta. Bul.* 404 (1940), pp. 289-303).—Studies of the *S. choleraesuis* (*S. suispestifer*) group of pathogenic bacteria have shown the *kunsendorf* variety to be the predominant type among these bacilli in the United States, *S. choleraesuis*, which for-

² Jour. Biol. Chem., 87 (1930), No. 2, pp. 251-257, fig. 1.

³ Jour. Biol. Chem., 119 (1937), No. 1, p. CI.

merly predominated, now being found only occasionally. "By the use of the Wassén technic, it was possible to isolate specific components from all the *kunzendorf* strains examined. Three cultures of the *kunzendorf* type were found to occur naturally in the diphasic state. *S. typhisuis*, *S. typhisuis* var. *voldagsen*, and *S. paratyphi* C were not found among cultures isolated in the United States. Biochemical tests were of great value in identifying the bacilli. The failure of the cultures to ferment arabinose, trehalose, and inositol served to distinguish them from other *Salmonella* types. Micro-organisms of the *S. choleraesuis* group were found not only in hogs but in man, foxes, cattle, dogs, chickens, and canaries. In addition to the *S. choleraesuis* group, numerous other *Salmonella* types occur in hogs."

Benefits of eradicating Bang's disease, J. R. MOHLER, A. E. WIGHT, and E. LASH (*U. S. Dept. Agr., Misc. Pub. 384* (1940), pp. [1]+18, figs. 6).—The status of Bang's disease eradication and the benefits to be derived are outlined in this publication.

Studies with *Clostridium chauvoei* (blackleg) aggressin, I. LIVE (*Jour. Immunol.*, 39 (1940), No. 2, pp. 137-162).—Natural aggressin, culture filtrate, and sonic extract of *C. chauvoei*, the strictly anaerobic, spore-forming organism causing the highly infectious blackleg disease of young cattle and sheep, reduced phagocytosis in vitro when present in the phagocytic mixtures. "By allowing the aggressin to act upon serum and upon leucocytes, it was shown that the inhibition of phagocytosis was due to fixation of opsonins and not to a direct action upon the leucocytes. The agglutinative titers of two antisera were diminished when the different dilutions of the sera were mixed with equal quantities of aggressin, filtrate or extract and incubated for 1 hr. prior to setting up the test. Three pairs of rabbits were immunized by intravenous injection of washed suspensions of live organisms, formalin-killed organisms, and culture filtrate, respectively. The antisera thus produced were used in complement-fixation and precipitative tests, and they all gave positive reactions with culture filtrates, natural aggressin, and extracts of *C. chauvoei*. The fact that suspensions of washed organisms free of by-products of growth, and particularly suspensions of washed formalin-killed organisms, stimulated the production of antibodies which reacted with antigen in aggressin and filtrate proves that the latter contain soluble material derived from disintegration of the bacterial cells."

A list of 50 references to the literature is included.

Serological studies with black-leg aggressin, I. LIVE (*Jour. Bact.*, 39 (1940), No. 6, pp. 753, 754).—This is an abstract of a contribution on serological studies with blackleg aggressin, which included phagocytosis, agglutination, complement-fixation, and precipitation tests, that were undertaken to determine whether the immunizing potency of blackleg aggressins could be ascertained in vitro. It was found by phagocytosis experiments that the aggressins had an inhibitory influence which was due to antiopsonic action and not to direct effect upon the leucocytes. "The reduction in phagocytosis was proportional to the quantity of aggressin used. The action of aggressin upon an immune serum did not impair the agglutinating property of the serum. Complement-fixation and precipitation tests demonstrated that the quantity of autolyzed bacterial substance present in an aggressin could be determined by the use of antisera produced in response to injections of washed live, as well as formalin-killed, suspensions of *Clostridium chauvoei* and of aggressin. Injections of a filtrate of sonically disintegrated *C. chauvoei* into guinea pigs protected the animals against subsequent infection. These findings, coupled with the fact that killed bacterial cells, free of any aggressin, are known to immunize effi-

ciently against blackleg, would strongly suggest that the autolysates of the organisms present in blackleg aggressins are responsible for the immunizing quality of the latter. Thus, the concentration of dissolved bacterial substance in blackleg aggressins could be evaluated by means of the complement-fixation and precipitin tests."

[Internal parasites of sheep] (*Georgia Sta. Rpt. 1940, p. 47*).—Reference is again made (*E. S. R., 82, p. 822*) to the station work on important parasites of sheep, including the stomach worm (*Haemonchus contortus*), the nodular worm (*Oesophagostomum columbianum*), and tapeworms, and means of control.

Effect of phenothiazine on the development of roundworm larvae in the feces, D. A. SHORE and R. T. HARRMANN. (*U. S. D. A.*) (*Vet. Med., 35 (1940), No. 8, pp. 454-457*).—The administration of phenothiazine in gelatin capsules to one sheep at the rate of 7 gm. per day for 3 days and to two other sheep at the rate of 0.5 gm. per day in the feed for 7 and 9 days, respectively, completely inhibited the development of nematode larvae, with the exception of *Strongyloides papillosus*, in cultures made from the feces of these animals. "This inhibition of larval development was manifested in the culture made from the feces 48 hr. after the administration of the first dose of phenothiazine and continued for 48 hr. after the last dose had been given. The number of *Strongyloides* larvae was reduced. When administered at the rate of 0.25 gm. per day in the feed, phenothiazine failed to inhibit larval development. Phenothiazine mixed thoroughly with sheep feces containing *Haemonchus contortus* eggs only, at the rate of 1 percent by weight, inhibited the development of all larvae. When mixed with feces in amounts of less than 1 percent, larval development was retarded."

Primary encephalomyelitis in goats associated with *Listerella* infection, L. S. KING (*Amer. Jour. Pathol., 16 (1940), No. 4, pp. 467-478, pls. 3*).—In a series of nine goats spontaneous encephalitis associated with *Listeria* (*Listerella*) infection (see *E. S. R., 83, p. 541*) was observed. "Pathologically the lesions were essentially restricted to the brain stem, especially the medulla and spinal cord. Peripheral nerves and ganglia were inconstantly affected. There was an associated meningitis. The primary parenchymal lesion is a circumscribed focal collection of mononuclear cells (with or without an admixture of a few neutrophilic leucocytes) in close relation to a blood vessel. The infection is very fulminating. Diffuse tissue infiltration may supervene, sometimes with the formation of small abscesses, but these are secondary and late phenomena. The blood vessels show marked degenerative changes, coupled with cellular infiltration of the walls and adventitia. Bacteria can frequently be demonstrated histologically in the parenchymal lesions. Nerve cells may be destroyed, but there is relatively little tissue necrosis."

Data on experimental transmission and pathogenesis are briefly discussed. The similarity to rickettsial encephalitis and cerebral toxoplasmosis is pointed out. A list of 31 references to the literature is included.

Production and immunological studies on toxic substances produced by streptococci isolated from equine encephalomyelitis, G. T. KUNSLER. (*Purdue Univ.*) (*Jour. Bact., 39 (1940), No. 5, p. 631*).—Streptococci isolated from the brain of horses having fatal infections of equine encephalomyelitis were capable of producing toxic substances when grown in vitro on a suitable medium. "These substances were found to be filtrable and were titratable on white mice and 12-day-old chick embryos. Their toxic action could be counteracted by either formalin or specific immune serum, as shown by in vivo tests. Filtrates containing these toxic substances when formalinized and used as antigens induced the development of a degree of immunity in an inbred strain of

white mice which agreed favorably with that induced by chick embryo vaccine. Immunity was determined by the intracranial injection of varying minimum lethal doses of the western strain of equine encephalomyelitis virus." Strains of streptococci isolated from poliomyelitis could likewise produce toxic substances when cultivated in vitro. These were similar to those produced by equine encephalomyelitis streptococci, and were rendered atoxic by the use of specific immune or antistreptococcus poliomyelitis serum.

The effect of hookworm infestation on the coagulation time of dogs' blood, M. GREENSAFT and R. SPENCER (*Vet. Med.*, 35 (1940), No. 8, pp. 462, 463).—In the course of study of 30 stray dogs collected at random, it was found that 36.6 percent were infested with hookworms. The average coagulation time of the infested dogs was 44 percent longer than the average of the noninfested dogs.

Fleas as acceptable intermediate hosts of the dog heartworm *Dirofilaria immitis*, W. A. SUMMERS (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 3, pp. 448-450).—The dog flea, the cat flea, and the human flea, collected from dogs harboring *D. immitis*, have been found by the author to be naturally infected with the microfilarial and larval stages of this parasite. "The female fleas seemed much more susceptible to the infection than the males. All three species of fleas have been experimentally infected, and in all three the extra-mammalian phase of the life cycle has been completed. The time required for this development in fleas was 120 hr. in warm weather and 216 hr. in cold weather. This phase of the life cycle was more rapidly achieved in fleas than in mosquitoes. It appears that both biologically and epidemiologically fleas are more suitable intermediate hosts of *D. immitis* than had been previously supposed."

Coccidiosis of domesticated animals and fowls, J. L. WEST. (Ala. Polytech. Inst.). (*Jour. Amer. Vet. Med. Assoc.*, 96 (1940), No. 758, pp. 603-606).

The effect of *Eimeria tenella* (coccidia) upon the blood sugar of the chicken, I. PRATT. (Univ. Idaho). (*Amer. Micros. Soc. Trans.*, 59 (1940), No. 1, pp. 31-37).—In studies of *E. tenella* in Idaho, a severe coccidiosis caused a marked rise in the blood sugar of the chicken by the sixth day after infection. "Starving the chickens for 19 hr. before making the determinations caused the blood sugar level to be lower than that in chickens on feed, but did not prevent the marked rise during acute coccidiosis. Withdrawal of large quantities of blood from the hearts of normal, uninfected chickens caused their blood sugars to increase approximately the same amount as did coccidiosis in other chickens. Starvation of uninfected chickens for 72 hr. did not cause a marked rise in blood sugar. The loss of blood from the cecal pouches of the chicken during the acute stage of coccidiosis probably caused the marked increase in blood sugar at that time."

Effect of four grades of sulphur upon artificially produced coccidiosis: Preliminary report, O. E. GORF and C. W. UPP. (La. Expt. Sta.). (*Poultry Sci.*, 19 (1940), No. 3, pp. 180-186).—The authors outline a technic for the preparation and evaluation of cultures of coccidia. The data obtained indicate that "each of the four grades of sulfur tested, namely, flowers of sulfur, commercial flour sulfur, 325-mesh sulfur, and micronized sulfur, has value in preventing coccidiosis mortality. No accurate evaluation of the protective value of each sulfur grade was made, but data indicate that of the ground crude sulfurs, the finer the grind the greater the effectiveness. Commercial flour sulfur retarded growth less than other grades of sulfur and gave the least protection from coccidiosis. The addition of poultry charcoal in the amount of 5 percent to rations containing 5 percent sulfur apparently enhanced the pro-

tective value of the rations. Regardless of the grade or amount of sulfur fed, chicks inoculated with coccidia produced oocysts which were viable, would sporulate, and produce clinical evidence of the disease. The use of elemental sulfur in the prevention of coccidiosis remains in the experimental stage, and recommendations for its use are not presented."

Immunity to fowlpox studied by means of skin grafts on chorioallantois of chick embryo, E. W. GOODPASTURE and K. ANDERSON (*Arch. Pathol.*, 30 (1940), No. 1, pp. 212-225, figs. 2).—Experiments reported conclusively proved that "the epithelial cells of skin from chickens with acquired immunity to fowl pox, and completely resistant to infection by cutaneous inoculation while a part of the immunized host, become quite susceptible to infection by this virus after being grafted onto the chorioallantoic membranes of chick embryos. If such grafts, as well as grafts from normal chickens, were regrafted on muscle of immune chickens and inoculated, no infection took place. Normal skin, on the other hand, when regrafted on the muscle of normal chickens was quite susceptible to infection by inoculation. These experiments therefore gave no indication that acquired immunity was inherent in the epithelial cells themselves, but pointed rather to humoral or local factors in other tissues as the cause of the acquired resistance of the normally susceptible epithelium."

Transmissible fowl leukosis: A review of the literature, C. OLSON, JR. (*Massachusetts Sta. Bul.* 570 (1940), pp. 48).—This review, brought together with a list of 240 references to the literature, deals with the subject under the following headings: Historical aspects, types of transmissible fowl leukosis (erythroblastic leukosis and granuloblastic leukosis), types of disease sometimes classified as "fowl leukoses" (lymphocytoma, myelocytoma, and fowl paralysis), incidence of fowl leukosis, transmission of fowl leukosis, the transmissible agent, immunity, treatment, and attempts to produce leukosis without the use of the specific agent. A synopsis in table form of the various transmissible strains of fowl leukosis agent reported by investigators, which includes the author, reference, and year described, strain, number of serial passages, and type of disease produced, is included.

Fowl pox and laryngotracheitis vaccination, G. KERNOHAN (*Nulaid News*, 18 (1940), No. 4, pp. 8, 9, 16).

Twentieth annual report on eradication of pullorum disease in Massachusetts, H. VAN ROEKEL ET AL. (*Massachusetts Sta. Control Ser. Bul.* 103 (1940), pp. 13).—The annual report for the season 1939-40 (*E. S. R.*, 82, p. 110) on pullorum disease eradication reveals a marked increase over the preceding year in the number of tests made, also increases in the number of tested fowl flocks and turkeys. In 6 of the 12 counties no reactors were detected in the flocks tested, emphasizing definite progress in eradicating the disease and establishing and maintaining pullorum-free flocks in the State.

Further studies on the pathogenicity of *Trichomonas gallinae* for baby chicks, N. D. LEVINE and C. A. BRANDLY. (*Univ. Ill.*). *Poultry Sci.*, 19 (1940), No. 3, pp. 205-209, figs. 2).—The authors report upon further studies (*E. S. R.*, 81, p. 718; 82, p. 542) of a disease of the upper digestive tract characterized by dry, caseous multiple foci on the mucous membranes of the crop and esophagus that is caused by *T. gallinae*. "Experiments in the transmission of the disease to baby chicks by the feeding of the trichomonads from culture showed that most of the chicks utilized did not become infected, but that scarification of the esophagus before feeding allowed some chicks of a resistant lot to become infected. A marked difference was noted in susceptibility of chicks from different sources. Chicks from one source were readily infected, while those from two other sources were very refractory to infection.

The results of this study indicate that chickens are relatively resistant to upper digestive tract trichomoniasis, but that individual differences in resistance and concomitant diseases may allow the protozoa to set up a pathologic condition."

Poultry diseases in the Southern States, M. W. EMMEL. (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 96 (1940), No. 758, pp. 600-602).

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Arizona Station] (*Arizona Sta. Rpt. 1939*, pp. 42-44, 45, 46).—This report notes ground-water studies in the Cortaro-Marana district, the Elroy pumping district, the upper Santa Cruz Valley, the Queen Creek ground-water basin, and the Little Chino Valley, and a summary of a report of a committee appointed by the Governor to study and report on ground-water law.

Stock-water developments: Wells, springs, and ponds, C. L. HAMILTON and H. G. JEPSON (*U. S. Dept. Agr., Farmers' Bul. 1859* (1940), pp. 11+70, figs. 44).—It is pointed out that although it is quite commonly believed that improved livestock-watering facilities are required only in range areas in the arid and semiarid States, many sections of the more humid States have inadequate watering facilities on farm pastures. Recent periods of drought have revealed these deficiencies. Pasture water supplies that may be well located and have served satisfactorily for several years often go dry during or immediately following repeated dry periods. The development of necessary pasture and range watering facilities aids indirectly in the establishment of beneficial soil and water conservation practices in both range and agricultural areas. With proper development and distribution of water supplies, grazing can be restricted on overgrazed, eroded, or depleted range land and the livestock systematically rotated over other areas according to their grazing capacity. In farming areas adequate water supplies in pastures will encourage more uniform grazing, facilitate pasture-improvement practices, and retard erosion damage. They may also enable profitable utilization for pasture of soil-conserving crops and of erodible or steep areas unfit for producing cultivated crops.

This publication takes up, among other topics, planning stock-water developments, wells, troughs and tanks, springs, reservoir inflow, excavated reservoirs, impounding reservoirs, and protection and maintenance. The impounding dams dealt with are of the earth-fill type for small reservoirs. Natural and artificially made vegetated spillways and mechanical spillways for such reservoirs are also described and illustrated.

Influences of vegetation and watershed treatments on run-off, silting, and stream flow.—A progress report of research (U. S. Dept. Agr., Misc. Pub. 397 (1940), pp. 80, figs. 26).—Prepared by the Forest Service and the Soil Conservation Service, an introductory section on soil, vegetation, and water flow describes the hydrologic cycle and related phenomena. The investigational data are detailed under the further heads factors affecting infiltration, influences of vegetation on water behavior, consequences of change in vegetal cover, run-off and erosion control by cropping practices and mechanical measures, and current research in water conservation, with numerous subtopics.

Lining irrigation canals to save water, O. W. ISRAELSEN (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 3, pp. 5, 11, figs. 2).—Considering the welfare of all the people in an irrigated valley or State, the lining of irrigation canals is valuable (1) for saving of water for use in irrigation, (2) for reduction

of the cost of drainage of irrigated land, and (3) for conservation of soil productivity. To the stockholders of a mutual irrigation company, however, the lining is valuable only to the extent that it saves water for the use of the stockholder irrigators. The drainage systems are usually not under the management or control of the irrigation company, and, therefore, the reduction of drainage costs does not directly influence the canal company officials. Likewise the lands that need protection against waterlogging and alkali concentration are frequently far removed from the canals that sustain seepage losses. At present the cost of lining must be justified largely, if not entirely, on the basis of the value of the water saved. The author analyzes the costs and savings involved in lining canals with cement concrete and reduces his results to a formula for estimating the justifiable cost per square foot of lining.

Dynamic properties of soils as applied to the elements of implement design: Development of reduced-friction surfaces and materials for experimental plows, F. A. KUMMER. (Coop. Miss. Expt. Sta.). (*Alabama Sta. Rpt. 1938, pp. 7, 8*).—Comparative field tests on two types of bottom plows having, respectively, impregnated wooden surfaces and standard steel moldboards revealed that the impregnated wooden surfaces produced considerably better scouring than the steel moldboards. Tests of sliding friction between soil and wood or metal surfaces showed that under the same conditions considerably less force was required (in some cases 50 percent less) to move the impregnated wooden sliders over the soil than was required to pull the steel sliders.

Repairing farm machinery, I. G. MORRISON (*Danville, Ill.: Interstate, 1940, pp. [16]+181, figs. [133]*).—The author has assembled instructions and methods for repair of some of the more generally representative farm machines. The book is designed primarily to be of use in the training of teachers of vocational agriculture, as a reference book for students in this field, and as a manual for farmers in farm-machinery repair. The repairing of mowers and of grain binders is dealt with in much detail, attention being called to the fact that many of the jobs on the mowing machine are applicable to other farm machines, especially to the cutting mechanism of binders and combines. Less detailed instructions for the repair and adjustment of the walking plow, wheeled plow, disk harrow, spike-tooth harrow, spring-tooth harrow, cultivator, corn planter, grain drill, side-delivery rake, and corn binder are given, together with a short section on the painting of farm machinery.

A lamp-type electric pig brooder, F. E. PRICE, A. W. OLIVER, and I. BRANTON (*Oregon Sta. Cir. 135 (1940), pp. 4, figs. 4*).—The device described is made in the form of a right-angled triangle to fit into a corner of the pen, the two short sides being 3 ft. in length. The framework is of 2- by 4-in. material and is supported by three 12-in. legs of the same, placed in the angles. The top, or hover, is of 0.25-in. or 0.5-in. plywood and has a centrally placed circular opening, 12 in. in diameter, over which is set a sheet-metal reflector cone carrying a rubber-covered socket and a 100- or 150-w. electric-light bulb. The use of rubber-covered shop extension cord is considered necessary to safety. The reflector opening is to be framed, on the under side of the hover, with 2- by 2-in. pieces, and a protective covering of 0.5-in. mesh hardware cloth is to be attached to this frame. The brooder is to be protected from the brood sow by two 2- by 12-in. planks set one above the other to form a 2-ft. wall resting on the long side of the triangle and attached to the side walls of the pen.

The use of this equipment reduced losses during cold weather.

AGRICULTURAL ECONOMICS

Investigations in agricultural economics by the Georgia Station, 1939-40]. (Coop. U. S. D. A.). (*Georgia Sta. Rpt. 1940*, pp. 6-8).—Data are included as to the types of farms, net cash returns per farm, relative labor requirements and net cash returns per acre for cotton and peppers, and the relative labor requirements for oats and corn and as to the percentages of cotton of different grades and staple lengths of the 1938 and 1939 crops in the State and in different areas of the State.

[Investigations in agricultural economics] (*Ohio Sta. Bimo. Bul. 205* (1940), pp. 122, 123, 144.—Under the heading of Relative Cost of Hay-Crop Silage and Corn Silage, by F. L. Morison, a table is included based on a study of 120 farms in 1939, showing by operations a respective cost per acre prior to harvest of alfalfa, soybeans, and corn for silage of \$9.15, \$13.31, and \$17.54 and of harvesting \$10.96, \$16.03, and \$10.69. The table of index numbers of production, price, and income, by J. I. Falconer (*E. S. R.*, 83, p. 835) is brought down through April 1940.

[Investigations in agricultural economics by the Rhode Island Station, 1939] (*Rhode Island Sta. Rpt. [1939]*, pp. 4-8).—In addition to results previously noted, some findings are included regarding (1) the relative prices, 1931-39, of locally grown and Maine No. 1 Green Mountain potatoes in Providence and of Green Mountain No. 1 potatoes in Providence and Boston, and the possibilities of increasing local production, (2) the profitableness of feeding different amounts of roughage and concentrates to dairy cows and of growing more roughage, and (3) shipments of canned milk into the State, sources of the milk supply of the State, average daily sales of different groups of distributors, and the changes in total population and in percentages in different age groups.

[Papers on agricultural economics] (*Ohio Veg. and Potato Growers Assoc. Proc.*, 25 (1940), pp. 25-52, 142, 144-148, 150, 152).—Included are the following papers presented at the twenty-fifth annual meeting of the Ohio Vegetable and Potato Growers Association: The Northeast Vegetable and Potato Council, by R. A. Porter (pp. 25-32); A Program for Improving the Marketing of Ohio Produce, by P. R. Taylor (pp. 32-44) (U. S. D. A.); and Are Retail Prices Reliable Guides to Quality? (pp. 44-52) and Factors of Grade Affecting the Marketability of Ohio Potatoes (pp. 142, 144-148, 150, 152), both by C. W. Hauck (Ohio Expt. Sta.).

Annals of International Confederation of Agriculture [trans. title] (*Ann. Conféd. Internat. Agr.*, 20 (1938), pp. 316).—Included in addition to the proceedings of the general meeting at Praha (Prague), July 7-10, 1938, and the meetings of the special commissions on cooperation in agriculture and on questions on agricultural labor, and a description of the composition of the confederation are the following papers: The Viewpoint of Agriculture Upon the Possibility of Obtaining Reduction of Obstacles to International Trade, by E. Laur (pp. 111-119); Agricultural Insurance as One of the Fields of the Confederation, by W. Beinzer (pp. 120-151); The Fields of the Confederation in Domestic and Foreign Trade. (a) in Plant Products, by L. Feierabend (pp. 152-160), and (b) in Animal Products, by K. Langenheim (pp. 161-180); Conclusions of the First Session of the Permanent Agricultural Commission, by G. Mullie (pp. 181-191); The Accessions of Agricultural Workers in the Working and Ownership of Land, by F. Angelini (pp. 192-207); and The Problems of Unemployment and Poverty of Agricultural Labor, by A. Borel (pp. 208-283).

Farm credit in Hempstead County, E. E. SPARLIN (*Arkansas Sta. Bul.* 399 (1940), pp. 24, fig. 1).—The county was selected as representative of the coastal plain of southwestern Arkansas. Records for 1938 as to land inventory, crops, livestock, equipment, cash income, expenditures, and the amount, source, delinquency, and cost of credit used were obtained by interviews with 103 small owners, 11 plantation owners, and 56 tenants selected at random and from bank officials and county records. An analysis is made by groups—tenants, small owners, and plantation owners—of production credit, long-term credit, including trends, and the effect of high ratio of indebtedness on farm plans and operation.

The numbers using short-term credit and the average amounts used were small owners 64 and \$159, plantation owners 2 and \$638, and tenants 43 and \$152. The percentages of the number of loans obtained from different sources were local banks 21.2, merchants 17.8, production credit association 18.7, individuals 11, landlords 7.6, U. S. D. A. Farm Security Administration 11, and other sources 12.7. The costs, including all charges, were landlords 16 percent, local banks 15.5, production credit association 10.4, individuals 9.4, and others 9.8 percent. The averages by tenure were small owners 10.4 percent, plantation owners 5, and tenants 15.3 percent. The average costs decreased from 13.5 and 13.7 percent for the gross-cash-income groups \$250 or less and \$251–\$500 to 7.5 and 5 percent for those of \$2,001–\$5,000 and \$5,001 and over. The average percentages of loans delinquent December 31, 1938, by sources of credit were local banks 4, production credit association 4.5, merchants 33.1, Farm Security Administration 84.6, and others 27, averaging 26.3 percent. Long-term credit was used by 39.8 percent of the small owners, 27.3 of the plantation owners, and 17.9 percent of the tenants. Of the total amount of such credit the Federal Land Bank furnished 47.8 percent, individuals 29.1, local banks 4.1, Land Bank Commissioner 7.3, Farm Security Administration 6.6, insurance companies 2.6, and other sources 2.5 percent. Small owners and tenants with heavy indebtedness devoted a larger share of their farm enterprises to cotton and depended more upon one crop for cash income than did those with lower indebtedness.

Farm credit in Ashley County, E. E. SPARLIN (*Arkansas Sta. Bul.* 400 (1940), pp. 16, fig. 1).—This study of Ashley County, representative of the southeastern part of the State, is similar to the study noted above. It is based upon farm records for 1938 from 104 small owners, 12 plantation owners, and 41 tenants.

Sixty-nine small owners, 10 plantation owners, and 35 tenants used short-term credit, the average size of the loans being \$165, \$3,271, and \$181, respectively. Of the total amount, 53.6 percent was furnished by local banks, 18.5 by merchants, 9.3 by production credit association, 6.2 by landlords, 4.5 by individuals, 2.2 by the U. S. D. A. Farm Security Administration, and 0.7 percent by others. The average costs were 12.8 percent for small owners, 8.4 for plantation owners, and 17.6 percent for tenants. The two lower gross-cash-income groups paid approximately 15 percent and the \$5,000 and over group 7.4 percent. On December 31, 1938, 30.9 percent of the loans were delinquent. The percentages for different sources of credit were: Production credit association 15.4, local banks 24.5, merchants 35.3, Farm Security Administration 62.5, and others 34.4. Long-term credit was used by 39.4 percent of the small owners, 58.3 of the plantation owners, and 12.2 percent of the tenants. The Federal Land Bank furnished 66.6 percent of the funds, local banks 15, Land Bank Commissioner 6.7, individuals 4.3, Farm Security Administration 3, insurance companies 1.3, and other sources 3.1 percent.

Factors affecting success of farm loans: A study of lending experience in seven counties in east-central Illinois, 1917–1938, J. ACKERMAN and L. J. NORTON (*Illinois Sta. Bul.* 468 (1940), pp. 457–527, figs. 6).—This bulletin

is based on the history and applications and appraisal reports for 827 first-mortgage loans made between 1917 and 1933, a survey of 66 of the borrowers, personal observations and interviews regarding 103 of the borrowers on foreclosed farms, land-use records for 1935 for 338 of the farms, financial records for 92 owner-operated farms, etc. An analysis is made of the following factors in their relation to success of loans: Quality of land, date of loan, loan ratio, topography, transportation facilities, farm organization, and personal qualities of borrowers, and of the causes of foreclosure and influence of debt burdens on land use and farm organization. Some of the findings were: On April 1, 1936, 14 percent of the loans had been paid. The principal and interest payments had been met on 52 percent, extensions had been granted on 17 percent, 4 percent were delinquent, and 13 percent had been foreclosed or the land transferred voluntarily to the lender, extensions had been granted on 17 of the loans were on farms with good soils, intermediate, and inferior soils, respectively. Loans averaged 36 percent of their appraised value where the loans had been paid and 43 percent where foreclosures had been made. On the farms acquired by lenders the percentages on different soils and net loss per \$1,000 loaned were, good soils 21 and \$16.10, intermediate soils 35 and \$45.99, and inferior soils 44 and \$106.29. The net losses on farms appraised at from \$50 to \$99 per acre were \$92 per \$1,000 loaned and on farms appraised at from \$150 to \$199, \$145. The percentage of foreclosure and losses were highest on loans made before 1925.

Net loss on foreclosed farms was \$3 per \$1,000 where the loan ratio to appraised value was from 20 to 29 percent and \$37 where it was over 40 percent. On good soils the medium-sized farms were the best risks; on inferior soils small farms were the best. The percentage of foreclosures was highest on farms with a high proportion of the land in crops. The most important factors given by the individuals acquainted with the situation on 103 farms acquired by the lenders were personal, such as poor management, extravagance, laziness, failure to control erosion, too much equipment, etc., for 47 farms; accidental, such as death, ill health, etc., for 29; and capital—too heavy indebtedness, speculation, low incomes, etc.—for 27. The information obtained from land use and financial records of owner-operated farms showed that on delinquent and foreclosed farms the percentage of land in crops was higher and that of soil-depleting crops was approximately 6 percent higher, while the successful loans were on farms on which the proportion of land in rotation pasture was higher, there was no relationship between loan ratio and percentage of cropland in soil-depleting crops, and there was a slight tendency for the farms with high loan ratios to have a high percentage of total land in crops.

"Fair value" and the deficiency judgment, J. L. TIERNEY (*Jour. Land and Pub. Util. Econ.*, 16 (1940), No. 2, pp. 181-195).—This is a discussion of the legislation and court decisions.

Uncollected property taxes in Montana, R. R. RENNE and O. H. BROWNLEE (*Montana Sta. Bul.* 382 (1940), pp. 39, figs. 21).—An analysis is made of the amount, growth, causes, and means of reducing Montana property tax delinquency, with special emphasis on rural property.

Total unpaid taxes on June 30, 1939, amounted to nearly \$27,000,000, or 8.2 percent of the total taxable valuation of the State, and was twice as large as in 1930 and four times as large as in 1920. Approximately \$18,398,000 of unpaid taxes were outstanding against property carried on the current tax rolls, being equivalent to a 56-mill levy on the total assessed taxable valuation of the State. About 4½ million acres of land were subject to tax deed (delinquent 5 yr. or more), and an equal amount was already owned by counties.

The acreage was equal to 17 percent of the total taxable area. The county-owned acreage increased over 85 percent from that in 1925. Uncollected taxes on farm real estate on June 30, 1939, was 40 percent greater than those on all property. Delinquency was greatest in the more arid agricultural counties in the eastern half of the State. Methods suggested to reduce future delinquency are reduction of governmental costs through improved administrative efficiency and organization and the adapting of governmental services to community needs and resources, broadening the tax base, requiring local government units to build up cash reserves in years of good income, assessment of lands on a true productivity basis, and increase of farm income by better prices of farm products and improved land use and farm management practices.

Rural tax delinquency study of the State of Oregon, W. H. DRESEN (*Oregon Sta. Bul. 371 (1940), pp. 21, figs. 2*).—Included are the results of four surveys made to determine the relationships between (1) size of farms and tax delinquency existing on the tax rolls from 1928 to 1932 in the summer of 1934 in eight counties, (2) delinquency and land types in six counties of the Willamette Valley, (3) delinquency and land use in Umatilla and Morrow Counties, and (4) delinquency and wheat yields in the five major wheat-producing counties—Umatilla, Morrow, Gilliam, Wasco, and Sherman. The history of rural tax delinquency studies in the State, the Oregon taxation laws, the recent changes in the laws, and the effects of the changes are discussed.

The size-of-farms study showed no significant correlation between size and tax delinquency, and that in each county there is one size group with a shorter average period of delinquency. In the Willamette Valley the average period of delinquency was shorter on lands adapted to intensive crops, general farming, and hay, grain, and seed production than on lands classified as adapted to pasture, general farming, and extensive farming. In Morrow County there was practically no variation in the degree of delinquency between different land-use areas. In Umatilla County the period of delinquency was 47 percent longer for timberlands and 24 percent longer on sage lands than for wheatlands; that on the better grazing lands was practically the same as for timberlands. In Umatilla County the average periods of delinquency were longer on the poorer yielding wheatlands and shorter on the better yielding lands. In the other wheat counties practically no correlation was found.

Land tenure in Arkansas.—II, Change in labor organization on cotton farms, J. G. McNEELY and G. T. BAXTON. (Coop. U. S. D. A.). (*Arkansas Sta. Bul. 397 (1940), pp. 26, fig. 1*).—This is the second bulletin in the series (*E. S. R.*, 82, p. 836). Data regarding total farms and cropland and cotton acreages and production by tenure and individual operating units during the period 1932–38 were obtained from A. A. A. records for all farms having more than the average amount of cropland and operated continuously by the farm operator in Chicot, Mississippi, and Pulaski Counties in the delta area, Independence and Pope Counties in the hilly upland area, and Clark in the coastal plain area. The areas and characteristics of the farms and labor organizations are described. An analysis is made of the changes in the farm labor organization during recent years, of the factors associated with the changes, and the changes in crop acreage on renter and sharecropper farms. A random sample was also selected for a special survey on crop acreages by tenure, numbers of tenants and wage earners, changes in mechanical equipment, and other factors relating to methods and systems of farming and labor organization.

From 1932 to 1938 the average number of resident families per 10,000 acres of cropland declined 20 percent in Chicot, 14 in Mississippi, 12 in Pulaski, 7 in Clark, 25 in Pope, and 19 percent in Independence Counties. In the

delta counties there was considerable shift from share renters and sharecroppers to wage laborers. In the coastal plain county sharecroppers replaced share renters as the predominating group, and wage families remained unimportant. The number of share renters and sharecroppers declined in the hilly upland counties. The percentage of cotton worked by wage hands increased, while that worked by share renters and croppers decreased in all counties. The cotton production control programs caused sharp declines in the cotton acreages in all counties, the reduction in the counties surveyed being over 40 percent from 1932 to 1938. Corn replaced cotton in the delta and coastal plain counties and pasture and feed crops, other than corn, in the hilly upland counties, and the labor requirements were substantially reduced. Number of tractors per 10,000 acres of land increased from 10.5 to 17.3 in Chicot County, from 12.5 to 29.6 in Mississippi, and from 16.8 to 24.3 in Pulaski County. Smaller increase took place in the coastal plain and hilly upland counties. The average cotton acreage per share renter declined from 25 to 13 and that for sharecroppers from 15 to 10 acres in the delta counties. In the coastal plain county the declines were from 19 to 11 and from 17 to 12 acres, respectively. Corn acreage per family increased only slightly for all tenure groups, and the acreage for other crops remained unimportant.

Some economic aspects of western range-land conservation, M. H. SAUNDERSON. (U. S. D. A.). (*Jour. Land and Pub. Util. Econ.*, 16 (1940), No. 2, pp. 222-226).—Some methods of conserving range lands are discussed.

An economic study of land utilization in Kent County, Delaware, R. O. BAUSMAN (*Delaware Sta. Bul.* 224 (1940), pp. 99, figs. 30, map 1).—The climate, soils, markets, and methods used in measuring land classes are described, and the trends in production of important crops and the numbers and different kinds of livestock and livestock products are discussed. The lands are divided into four classes—I, poorest grade, chiefly timber, brush, and marshland, 36.6 percent; II, largely open untillable land, 5.1 percent; III, poorest land suited to cropping, 28.8 percent; and IV, the best grade of cropland, 29.5 percent. The use of lands, soils, size and condition of buildings, crop yields, income, size of farm business, use of labor, social aspects—age, birthplace, former residence, education, farming experience, etc., of farmers, size of families, and occupation of mature children—roads, electric power and telephone service, etc., on different land classes are discussed. Some of the findings are as follows: The number of farms has decreased 8 percent since 1910 and the number of acres in farms 13.2 percent since 1900. Close relations were found between land classes and agricultural practices and reasonably close relationships between land classes and general soil types and size and condition of farm buildings. In land classes II, III, and IV the averages per farm were crop yield indexes 69, 96, and 107; labor incomes —\$225, —\$92, and +\$78; capital in real estate \$2,088, \$3,854, and \$6,528; productive man-work units 224, 343, and 468; and animal units 4.8, 10.8, and 14.1, respectively. As the lands increased in grade for agricultural use, the age of farmers decreased, the percentage of farmers from nonagricultural vocations decreased, percentage of children leaving school at the end of the eighth grade decreased, the proportion of sons taking up farming increased, and the percentage of roads hard-surfaced increased. Hard-surface roads increased the value of farm real estate per acre \$3.72, 11.9 percent, in land class III and \$6.48, 14.4 percent, in class IV.

Farm performance in north central South Dakota, 1930-1939, M. MEYERS (*South Dakota Sta. Bul.* 348 (1940), pp. 55, figs. 32).—The physical and social characteristics of the area, its importance in wheat production, and

the factors affecting wheat growing in the area are described. The data in from 29 to 165, total 658, farm reports each year, 1930-39, were analyzed to show the organization and performance of the farms. Comparisons were made of the 10 highest and 10 lowest income farms, 1932-39, to determine the factors influencing financial return.

The average annual operator's labor earnings (farm labor income plus value of farm products used minus value of unpaid family labor) ranged from -\$2,240 in 1934 to \$1,700 in 1936, averaging -\$408 for the 10 yr. 1930-39. For the years 1932-39 the yearly operator's earnings ranged from -\$1,001 to \$2,063, averaging \$320 on the higher income, and from -\$3,018 to \$602, averaging -\$1,118 on the low income farms. The high income farms were considerably larger, had larger cropped acreages, more productive animal units per acre, more equipment per acre, smaller percentage of investment in real estate and larger percentage in working capital, higher crop yields, higher livestock productive efficiency, handled more crop acres and animal units per man, and carried larger reserves of grain, roughage, and cash.

Rural zoning for Missouri? V. HUELBURT. (U. S. D. A.). (*Jour. Land and Pub. Util. Econ.*, 16 (1940), No. 2, pp. 151-158).—This is a discussion of rural zoning, using Missouri as an example.

Regulation or development for the Missouri Ozarks, C. H. HAMMAR. (Univ. Mo.). (*Jour. Land and Pub. Util. Econ.*, 16 (1940), No. 2, pp. 159-167, fig. 1).—This is a discussion of the preceding paper. Other technics for solving the land-use problems of the Ozarks are outlined.

Land utilization in China: A critique of methodology, C. Y. HSIANG. (Univ. Wis.). (*Jour. Land and Pub. Util. Econ.* 16 (1940), No. 2, pp. 226-229).—Criticisms are made of the methodology used in the study previously noted (E. S. E., 80, p. 120).

Efficient management of sheep ranches in southwestern Utah paid dividends in 1939, D. A. BROADBENT (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 3, pp. 6, 7).—An analysis of the records of a group of ranches operating over 250 head of ewes revealed marked differences between the extremes. Profits per breeding ewe were 2.77 and 22 ct., percentage of lamb crop at marketing time 84 and 64, weight per lamb at market 74 and 62 lb., pounds of wool per fleece 9.3 and 8.4, percentage death loss of stock sheep 6.7 and 11.6 and of lambs 5 and 12.6 for the 15 most profitable and 15 least profitable ranches, respectively. The possibility of increasing rate of production and decreasing death losses without significantly increasing the per unit cost of production is emphasized.

An economic study of commercial poultry farming in Florida, F. W. BEUMLEY (*Fla. Univ. Agr. Ext. Bul.* 105 (1940), pp. 95, figs. 3).—Records were obtained from 20 to 104, total 261, farms each year, 1926 to 1931-32. Analyses chiefly for the years 1926 to 1928-29 were made of the size; receipts; expenditures; labor income and factors affecting it; and the costs and returns in producing eggs, raising pullets, and incubating chicks and the factors affecting each.

Labor incomes averaged \$965 in 1926, \$48 in 1927-28, and \$694 in 1928-29, and in addition the farm privileges averaged \$400 in 1927-28 and \$459 in 1928-29. Fifty percent of the farms made labor incomes of more than \$1,000 in 1926, 7 percent in 1927-28, and 31 percent in 1928-29. Size of business, eggs per hen, labor and capital efficiency, and type of business were important factors affecting labor income.

Milk distribution as a public utility, W. P. MORRISON (*Chicago: Univ. Chicago Press*, [1940], pp. XVIII+221, figs. 2).—This volume is based on research work of the Wisconsin Experiment Station. It includes chapters on history

and background of fluid-milk regulation (pp. 3-12), characteristics of public utilities and comparison with the fluid-milk business (pp. 13-19), general survey of costs of milk distribution (pp. 23-31), analysis of operating costs and the possible savings through unification (pp. 32-89), profits (pp. 90-104), legal aspects of milk control (pp. 107-136), public ownership and public control (pp. 137-146), methods and difficulties of public utility control of milk distribution (pp. 149-169), what groups would gain under a unified distribution system (pp. 173-181), and conclusions and outlook (pp. 182-185). Appendixes include data on division of costs of milk distribution, supplementary information on delivery, and the effect of price upon the consumption of fresh and evaporated milk.

Factors affecting costs of milk production in southeastern Louisiana, J. N. EFFERSON and F. MERRICK (*Louisiana Sta. Bul. 321 (1940), pp. 8*).—Analysis is made of data for the crop year 1937-38 for 68 farms in Tangipahoa Parish. The average cost of production per 100 lb. of milk was \$2.18, varying from \$1.28 to \$4.29. Average net returns per farm varied as follows: Farms (24) with an average of 11 cows \$117, farms (23) with 34 cows \$553; with average production per cow of 2,331 lb. (20 farms) —\$28, with 4,487 lb. (23 farms) \$453; farms (21) receiving an average of \$1.94 per 100 lb. of milk —\$20, those receiving \$2.36, \$344; and —\$77 for the 20 farms with 44 percent of the total income from dairying and \$596 for the 24 farms with 80 percent of the income from dairying.

Twenty-five years of Illinois crop costs, 1913-1937, R. H. WILCOX and H. C. M. CASE (*Illinois Sta. Bul. 467 (1940), pp. 357-455, figs. 17*).—This bulletin summarizes crop-cost data in farm accounts kept by selected groups of cooperating farmers. The objectives, selection of cooperators, location and size of farms, and the methods of compiling and analyzing the data are discussed. The important factors influencing crop costs and the variations of costs between areas, years, and farms are discussed. An analysis is made of the trends in efficiency in production, labor requirements, changes in acreages of different crops, use made of time saved, and changes in the character of farm expenses. An appendix shows the year-by-year changes in costs of production.

Yearly operating expenses in the production of a composite acre (rotation two fields of corn and one each of oats and wheat) varied from \$18.30 in 1919 to \$7.80 in 1933; those for wheat declined from \$17.16 in 1914-15 to \$8.70 in 1935-36; those for corn were \$11.61 in 1913-15 and \$11.22 in 1935-37; those for oats \$7.27 and \$8.34, respectively; and those for soybeans \$17.08 in 1922-24 and \$9.11 in 1935-37. Yield increases per acre were wheat 4 bu., corn 15, oats 13, and soybeans 10 bu. The man labor requirements decreased from 18.5 to 9.6 hr. for corn, from 19.4 to 4.9 for wheat, and from 13.4 to 4.2 hr. for soybeans. That for oats declined approximately 40 percent. Due to the use of tractors, the decreases in horse-hours per acre were for corn from 43.6 to 1.4, wheat 34.6-5.1, and soybeans 29.1-2.6. The average number of hours of tractor work in 1936-38 for corn was 3.6, wheat 2, oats 1.3, and soybeans 2.4. Total costs of production per acre, including land charges and size of crop, were for corn in 1913, \$18.49 and 35 bu. and in 1937, \$18.19 and 61 bu.; wheat \$26.59 and 23.4 bu. in 1914 and \$14.01 and 27.2 bu. in 1936; oats \$14.20 and 31 bu. in 1913 and \$14.30 and 37 bu. in 1936; and soybeans \$29.04 and 15 bu. in 1922 and \$17.48 and 26 bu. in 1937. The net cost per bushel of soybeans was \$1.46 in 1922 and 68 ct. in 1937. Direct cash outlay in producing corn in 1913-15 was 14.1 percent and cash reserve for depreciation 4.3 percent of the total costs, and in 1935-37 28.3 and 8 percent, respectively.

Cost of curing white Burley tobacco with artificial heat, G. B. BYERS (*Kentucky Sta. Bul.* 406 (1940), pp. 333-351).—Data were obtained for 63 farms in 1938 and 32 farms in 1939 on which Burley tobacco was cured with artificial heat and on 22 farms in 1938 where the tobacco was air-cured. An analysis is made of fuel, labor, equipment, and housing requirements and costs. "The total cost of curing and drying with artificial heat averaged \$7.69 per acre, or 49 ct. per day for each acre, in 1938. Charcoal briquets and labor cost \$7.28 per acre, or 56 ct. per day for each acre of tobacco cured and dried in 1938. In 1939 the cost was \$3.83 per acre, or 53 ct. per day for each acre cured."

The composition of gross farm income since the Civil War, F. STRAUSS. (Coop. U. S. D. A.). (*Natl. Bur. Econ. Res. [New York] Bul.* 78 (1940), pp. 24, figs. 10).—The changes in the composition of total farm income and that from the domestic market and from farm exports are discussed. The total gross farm income ranged from \$2,554,000,000 to \$2,373,000,000 for the years 1869-73 and from \$6,233,000,000 to \$9,131,000,000 for the years 1934-37, of which 83.4 and 91.6 percent were from domestic markets in the respective periods.

The percentages of the total gross farm income in the periods 1869-83 and 1934-37 were for all staple foodstuffs 16 and 10, wheat 11.2 and 5.7, hogs 20.3 and 12.3, cattle 9.5 and 9.7, calves 0.3 and 1.6, sheep and lambs 0.5 and 1.2, all meat animals 30.6 and 24.8, cotton 12.6 and 8.8, cotton and cottonseed 12.6 and 10.4, tobacco 1.4 and 3.3, fruits 1.9 and 4.9, dairy products 10.2 and 15.9, chickens 2.3 and 4.2, eggs 2.5 and 7.5, and all other 22.5 and 19. The percentages of the gross income from the domestic market were wheat 10.2 and 5.7, all meat animals 35.2 and 28.4, cotton 4.3 and 5.1, tobacco 0.4 and 2.4, fruits 1.8 and 4.2, dairy products 12 and 17.4, and chickens and eggs 5.8 and 12.8. The percentage contribution of different products to total agricultural exports were wheat 27.8 and 5.2, corn 6 and 2, pork and pork products 13.1 and 4.2, cattle and beef products 6.2 and 0.5, cotton 35.1 and 46, tobacco 2.9 and 17.7, fruits 0.4 and 10.8, and all other 8.5 and 13.6.

Variations in farm income and family living in Robertson County, J. H. BONDURANT and M. M. THARP (*Kentucky Sta. Bul.* 405 (1940), pp. 305-331, figs. 2).—The data were obtained from 152 farmers in the central and northern areas of the county for the year 1935 and from 61 of the same farmers for the year 1937.

The total receipts were \$735 per farm in 1935 and \$1,284 in 1937. The receipts from tobacco were \$515 higher in 1937, due to higher yields and prices and larger acreage. Labor incomes per farm averaged \$17 in 1935 and \$451 in 1937, and, in addition, the value of use of dwelling, fuel, and food produced and used amounted to \$347 and \$313 in the respective years. Size of business, tobacco yields, and net livestock receipts per productive animal unit were the principal factors affecting the variations in labor income in the same year. Farms large enough to develop a system of farming requiring from 300 to 500 productive man-work units produced the most satisfactory incomes.

Thirty years of farm prices and production in Kentucky, A. J. BROWN and D. G. CARD (*Kentucky Sta. Bul.* 403 (1940), pp. 189-237, figs. 30).—This compilation of available statistics includes tables and charts showing the monthly prices and relatives of prices for major and minor crops, livestock, and livestock products; the acreage, production, price, and farm value of crops; the number and value of livestock on farms; the index numbers, 1912-39, of estimated value of real estate; and the condition of pastures by months.

World wheat survey and outlook, January 1940, V. P. TIMOSHENKO and H. WORKING (*Wheat Studies, Food Res. Inst. [Stanford Univ.],* 16 (1940), No. 5,

pp. [2]+205-242, figs. 8).—Continuing the series (E. S. R., 82, p. 410), wheat prices in North America were strongly influenced during September-November 1939 by the selling policy of the Argentine grain board, which raised its selling prices only moderately following the outbreak of war and sold freely, favored by the fact that ocean freights from Argentina advanced no more than from North America. Canadian prices declined persistently under this competition, and in the United States prices responded only moderately to the sensational deterioration of prospects for winter wheat there. Severe crop damage in Argentina and a change in Argentine selling policy, however, contributed to sharp advances from late November to mid-December. At Antwerp, price increases during December were extreme, reflecting great further increases in ocean freights. International trade in wheat, curtailed in September and October, has since been larger than last year.

Farm storage and marketing of rough rice in Arkansas, O. J. HALL (*Arkansas Sta. Bul. 395 (1940), pp. 23, figs. 3*).—Data for the crop year 1937 were obtained by the survey method for 80 farms in Lonoke, Prairie, and Arkansas Counties, of which 11 had no farm storage. An analysis is made of the types and size of farm facilities, cost of farm and public storage, costs of transportation to farm granaries and public storage or markets, methods of sale and average monthly prices received by farmers 1909-10 to 1937-38, and purchasing power of rough rice 1920-21 to 1936-37.

Of the crop, 57.2 percent was moved from the farms at threshing time. The capacity of farm granaries varied from less than 2,500 to 28,000 bu., averaging 8,166 bu. The average annual depreciation per granary was \$41.46, repairs \$18.30, and interest \$26.48, being 1.2 ct. per bushel of capacity and 4.3 ct. per bushel stored in 1937-38. Public storage averaged 1.61 ct. per bushel for 1 mo. and 4.59 ct. for 6 mo. An average of 184.9 min. per load was used in hauling from the thresher to farm granary and then to market as compared with 141.6 min. where the rice was hauled directly to the market. Contract prices for hauling to market averaged 1.9 ct. from farm granaries and 2 ct. per bushel from threshers. Approximately 37.3 of the farms sold to local mills, 18 to local buyers, 23.3 to cooperative associations, and 0.3 to out-of-State buyers. From 1920-21 to 1936-37, the value of rice increased 7.5 times and decreased 3.2 times after October 15. On an average, the price in November was 105 percent of the October value, 108 in December and January, 110 in June, and 111 percent in July.

Farmers' cooperative marketing and purchasing associations in North Dakota, W. L. ETTERSVOLD (*North Dakota Sta. Bul. 294 (1940), pp. 26, figs. 5*).—This bulletin is based on a survey made in cooperation with the Farm Credit Administration of St. Paul, Minn. Most of the information was obtained for the fiscal year 1936-37. Data are presented as to the number of associations of different types, number of members and patrons and volume of business, and the laws affecting organization, time of establishment, financing, and operating results of the associations in the State.

Crops and Markets, [July 1940] (U. S. Dept. Agr., Crops and Markets, 17 (1940), No. 7, pp. 129-156, figs. 2).—Included are crop and market reports of the usual types.

RURAL SOCIOLOGY

Standards of value for program planning and building (U. S. Dept. Agr., Bur. Agr. Econ., 1939, pp. [2]+III+132).—These proceedings of the school for Washington staff of the Bureau of Agricultural Economics, held October 17-20, 1939, include papers on backgrounds; the place of government in modern society;

regionalism, nationalism, and internationalism; and problems of social adjustment and administration; and summaries of the discussion groups as follows: *Man as a Biological Phenomenon* (pp. 1-11), and *Culture Patterns and the Social Necessity of Adjustments* (pp. 70-82), both by M. A. Graubard; *Can Human Nature Be Changed?* (pp. 12-18), and *Individualism, Democracy, and Social Control* (pp. 28-32), both by R. B. Vance; *There Ought To Be a Law About It* (pp. 19-27), and *Democracy and Group Leadership* (pp. 83-92), both by E. G. Nourse; *Administration in a Democracy* (pp. 33-37), and *Problems of Centralization and Decentralization in Government and Administration* (pp. 57-61), both by L. M. Short; *Problems in Continuing a Program of Agricultural Adjustment* (pp. 38-47), and *A Desirable Foreign Trade Policy for American Agriculture* (pp. 62-69), both by J. S. Davis; *Culture and Agriculture*, by H. Miner (pp. 48-56); and *The Relation of the Administrator to the Farmer and the Expert*, by K. Young (pp. 93-103).

Relocation of farm families: Selected references on settler relocation, L. O. BERGAW (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. List 14* (1940), pp. 46).—This is an annotated list of references which relates to the literature concerning the relocation of farm families, especially isolated and submarginal settlers, in the United States.

Opinions on living in the open country and farming (*Rhode Island Sta. Rpt.* [1939], pp. 48-52).—This study reports the results of the opinions of the heads of 1,100 households concerning the advantages and disadvantages of living where they are, reasons for engaging in nonagricultural occupations, and preference as to a place to live if the heads of families were selecting a new residence.

Migration and social welfare: An approach to the problem of the non-settled person in the community, P. E. RYAN (*New York: Russell Sage Found., 1940, pp. [VII]+114*).—The author develops the social significance of migration in the western world, including chapters on migrations in the building of America, the depression, migration today, the impact of the migrant upon the community, the provision of assistance, proposals and experiments, and the national policy.

Professional migratory farm labor households, C. F. REUSS. (*Wash. Expt. Sta.*). (*Sociol. and Social Res.*, 24 (1940), No. 4, pp. 337-344).—The author concludes that "poverty is the greatest problem for the migratory farm labor family. Its greatest needs are some sort of economic security for slack harvest months and for old age, and some accurate method of directing the family to work opportunities and placing it in jobs when it arrives in the area."

The sugar cane farm: A social study of labor and tenancy, H. HOFFSOMMER. (*Coop. U. S. D. A.*). (*Louisiana Sta. Bul. 320* (1940), pp. 67, figs. 8).—"This study [based largely on data derived from 100 sugar farms of 30 acres or over] aims to describe from the social viewpoint the labor and tenancy arrangements on Louisiana sugarcane farms." The production of cane for sugar is located in the section known as the Sugar Bowl, comprising 20 parishes in the south-central part of the State. Seven percent of the cane operators have more than 70 percent of the total acreage. The sugarcane farm is conducted largely on a labor basis. Of more than 1,000 families (exclusive of owners and special workers) living on the farms studied, 83 percent were resident laborers, 14 percent tenants, and 3 percent sharecroppers. The position of the resident laborer on the sugar farm is analogous to that of the sharecropper on the cotton farm, excepting that the former is paid wages rather than a share of the crop and works on the farm at large rather than on an assigned acreage. A third of the sugar growers had business and occupational

interests in addition to growing sugarcane. One of the most important of these interests was in connection with sugar mills, of which there were 8 on the 100 farms studied. More than one-half of the workers on these sugar farms were colored. Among the share tenants, whites predominated with 72 percent, but 60 percent of the resident laborers and 64 percent of the croppers were colored. Labor demand on the sugarcane farm, in general, is about 3 times greater in December, the busiest month, than in July and August, the slackest months. Employment of women, nearly all of whom were colored, was greatest during the harvest season. During November, 22 percent of the total days of labor were contributed by women as compared with 5 percent during August.

One of the most persistent problems in the Sugar Bowl is that of providing sufficient year-round employment to support the labor population in the area. Off-season common labor was paid almost entirely by the day. The bulk of the farms paid \$1, but several paid as low as 75 and 80 ct. and roughly one-third paid 90 ct., which brought the average down to 97 ct. The highest wage reported was \$1.40. The most common day wage for cane cutting for males was \$1.25, with a range of from \$1 to \$2. The average wage for males was \$1.36.

Hours were longest during the cultivating and planting seasons. Roughly one-half of the operators reported days of from 10 to 11 hr., 46 percent from 11 to 12 hr., and the remainder less than 10 hr. Most of the laborers began work between 5 and 6 a. m. and quit between 6 and 7 p. m. All resident laborers conventionally received perquisites of some kind. Of 902 families, 898 received house and garden space, 9 out of 10 received wood, 7 out of 10 a team for hauling it, and 6 out of 10 some kind of farm equipment for working their gardens. One-third of the nonresident laborer families received perquisites, of which roughly three-fourths received them for only the 3-mo. harvest period. The most common perquisites were house or room and board and wood. Resident laborers on 50 of the 74 farms reporting received advances, 45 from their landlords and 5 from their merchants. The degree of responsibility as to the welfare of tenants and laborers varied among operators from scarcely any to almost complete care in sickness and old age. Contributions from operators to laborers and tenants for churches, funerals, and fines tended to be relatively more numerous on the larger farms.

A social and economic survey of Beadle County, South Dakota, B. R. McCLASKEY (*Chicago: Author, 1940, pp. [XI]+260, figs. 8*).—This is a study of the social action in boom and depression years in an agricultural community. The several chapters summarize the history of South Dakota and Beadle County and discuss the population, natural resources, business structure, farming, farm mortgage indebtedness, government, taxation, educational facilities, and social action and control in the county.

School services in rural communities in Washington County, J. L. CHARLTON (*Arkansas Sta. Bul. 398 (1940), pp. 43, figs. 7*).—This study, designed to show the nature and extent of high school participation, suggests the need for the following improvements: "First, public transportation, particularly for the benefit of the weaker districts; second, transportation and high school tuition for pupils from rural districts that do not provide high school facilities; third, enlargement of many of the rural school districts by means of consolidation; and, fourth, financial and operating management for rural schools. The wide discrepancy between the performance of the school system in village or town and in the open country shows that special measures for rural school improvement, considered separately from public school operations in general, must be undertaken if needed improvement is to be expected."

Sickness and medical care among a rural bituminous coal-mining population of Arkansas, I. C. WILSON (*Arkansas Sta. Bul.* 394 (1940), pp. 44, figs. 5).—Continuing this series (E. S. R., 81, p. 447), the 307 families in the Midland community, a typical rural bituminous coal-mining community in Sebastian County with a population of 1,189 persons (all white), were interviewed as to the state of their health, the costs and type of medical service utilized, and their indebtedness for medical care. The people of the community used the services of doctors in adjoining towns from 6 to 8 miles distant from Midland, and in the city of Fort Smith, 22 miles distant, and of dentists in towns from 8 to 10 miles distant and in Fort Smith. There were 4 hospitals available in Fort Smith, 1 tubercular hospital connected with the county farm for dependent persons, and free maternity wards for indigent mothers. There were no graduate nurses living in the community and only 66 graduate nurses in the county. Transportation and communication facilities were very good, only one-fifth of the families living in unimproved roads. Reports from heads of the family showed that 70 percent of the people were in good health, 15 in fair health, and 15 in poor health; that 81 had eye defects, and 2.5 percent had some degree of deafness. The total cost for medical service in this area was \$11,850.05, with an average expenditure of \$38.60 per family and \$9.96 per capita. The physicians' services were utilized by 67.4 percent of the families in this community, dental services by 11.4, chiropractic services by 1, services of medical care associations by 36.5, hospital services other than those of the medical care associations 5.5, oculists' services by 2.9, and midwives' services by 0.3 percent. A study of the families grouped according to income levels showed a close relation between income and state of health, number of illnesses, duration of illness, and type of illness.

Illegitimacy in rural Utah studied by rural sociology department: Offenders found to be mostly non-farmers, J. N. SYMONS (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 3, pp. 2, 4).—The author presents the rate of illegitimacy per 1,000 in the United States and in Utah, and discusses the age, residence, vocation, marital status, and mobility of offenders.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The land-grant colleges, G. A. WORKS and B. MORGAN (*Washington: Govt.*, 1939, pp. IX+141, figs. 2).—The legislation regarding financial support to, administration of, and work under the Federal grants for resident instruction, experiment station research, and agricultural extension work, is described. The relationship of separate land-grant colleges and State universities, matching requirement, extension work in home economics, extension and research in Negro land-grant colleges, relationship of extension to regulatory functions, variations in Federal control, uniform allotments to States, clarification of State and Federal relations, additional grants, and the influence of the Land-Grant College Association are discussed.

FOODS—HUMAN NUTRITION

[Nutrition studies by the Arizona Station] (*Arizona Sta. Rpt.* 1939, pp. 75-81).—Included in this progress report (E. S. R., 82, p. 275) are summaries of an extension of studies on vitamin A, including, in addition to the work previously noted (E. S. R., 83, p. 561), a comparison of biological and chemical methods for determining the vitamin A value of foods, and a study of dark adaptation in persons with a history of tuberculosis; on fluorine, particularly the fluorine content of foods; and on iron, with emphasis on the total weight of iron in the bodies of rats under different conditions. Brief reports are also given of a study of

the growth of Mexican school children and the effect of sunlight and feed on the vitamin D potency of milk.

[Food and nutrition studies by the Georgia Station] (*Georgia Sta. Rpt. 1940, pp. 64-66, 73, 74*).—This progress report includes an extension of earlier work (E. S. R., 82, p. 845) on available calcium to include certain calcium salts; on dark adaptation in school children, with a comparison of results by the biophotometer and vitamin A status as evaluated by the differential leucocyte method proposed by Abbott et al. (E. S. R., 81, p. 873); and on the ascorbic acid content of certain foods, including raw turnip greens and several varieties of tomatoes grown at the main station, the Mountain Substation, and the Coastal Plain Station. Progress is also reported on methods of freezing foods, with a discussion of advantages of the method of freezing before packaging and of problems still awaiting solution.

[Nutrition studies by the Rhode Island Station] (*Rhode Island Sta. Rpt. [1939], pp. 46, 47*).—Progress is reported on a continuation of studies on the nutritional status of college women with respect to vitamin C (E. S. R., 81, p. 148) and on vitamin A metabolism in human subjects as determined by a new type of adaptometer named the rhodometer.

Modern aspects of soft curd milk, R. L. MILL (*Farm and Home Sci. [Utah Sta.], 1 (1940), No. 3, p. 9*).—Reference is made to the pioneer work of the station on the distribution of the soft-curd characteristic in dairy cows and to the work in developing the test now in use to determine the softness of the curd of milk, and in relating superior digestibility to the soft-curd character. Natural soft-curd milk, modified milk, processed soft-curd milks prepared by the homogenization process or the base-exchange treatment, evaporated milk, and boiled milk are considered briefly as to softness and digestibility of the curd. It is pointed out that in selecting cows for the production of soft-curd milk care must be taken to select only animals which secrete such milk as a natural characteristic and to exclude animals which are producing soft-curd milk due to udder infection (subclinical mastitis).

The quality and vitamin content of green peas when cooked or home-canned, J. E. RICHARDSON and H. L. MAYFIELD (*Montana Sta. Bul. 381 (1940), pp. 19, fig. 1*).—The location and scope of this study and the methods of vitamin assay employed were similar to those of an earlier study on string beans (E. S. R., 81, p. 741). For the quality tests the Alaska, Laxtonian, Little Marvel, and Pioneer varieties were used and for the vitamin tests only Laxtonian. For all of the varieties 1 qt. of shelled peas weighed approximately 1½ lb. The peas were cooked by boiling for 30 min. in salted water in an uncovered aluminum saucepan and were canned by the steam-pressure cooker method, as recommended in a previous publication (E. S. R., 74, p. 278), and also, for purposes of comparison of spoilage records, by the hot-water bath and oven methods recommended in the same publication for acid foods only. No spoilage occurred in the peas canned by processing in the pressure cooker at a temperature of 240° F. for periods ranging from 30 to 50 min., but on examination 9 percent of the jars processed for only 30 min. showed the presence of viable organisms. Spoilage was extensive in the peas canned by the other two methods even when the processing was continued for long periods of time. In judging the quality of the cooked and canned (pressure cooker) peas, color changes were measured by the Munsell disks according to the technic described by Nickerson (E. S. R., 62, p. 503) and tenderness by the method described by Bonney et al. (E. S. R., 65, p. 190). The characteristic greenish yellow color of canned peas as compared with the green color of freshly cooked peas was found to consist of a change in hue, with very little change in brilliance and chroma. Determinations of pH indicated

that the change was due to increased acidity. In tenderness the canned peas met the Federal requirements for a standard product.

The vitamin A content calculated from growth data using vitamin A reference cod-liver oil for the standard was 4 International Units per gram for raw frozen peas, 8.6 I. U. for the same after boiling 30 min., 9.6 for pressure-canned peas (from the same lot) stored for 6 mo. and reheated 10 min., and 8.1 I. U. per gram for a sample of commercially canned peas stored 6 mo. and reheated for 10 min. The higher values for cooked than raw frozen peas was attributed to the increased digestibility on cooking. Vitamin B₁ values, also obtained by the growth method with vitamin B₁ International standard clay for comparison, in the same order of materials tested, were 1.02, 0.55, 0.82, and 0.82 I. U. per gram, respectively. Vitamin C values were estimated both biologically and chemically. By the former method the vitamin C content of raw frozen peas was 0.25 mg. per gram, home-canned by the pressure-cooker method 0.17 mg., and the same after storage for 6 mo. 0.13 mg. per gram. The average ascorbic acid values, as determined chemically, were raw 0.27 mg. per gram, boiled 30 min. 0.18, home-canned (pressure cooker at 240° for 45 min.) 0.19 mg. per gram for the unheated solids, 0.22 mg. per cubic centimeter for unheated juice, and 0.19 mg. per gram for peas and juice reheated together. The same canned peas showed no appreciable loss in vitamin C after storage for 8 and 12 mo. A sample of commercially canned peas had a considerably lower content. On the basis of the vitamin data, the authors conclude that an average serving of 70 gm. of cooked frozen peas or reheated peas canned at home under the above conditions would furnish about 600 I. U. of vitamin A, 60 I. U. of vitamin B₁, and 13 mg. of vitamin C.

Apple and cherry juice: Promising new outlets for Utah's fruit crops, F. M. Com (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 3, pp. 1, 10, figs. 2).—Methods adapted to home and farm use for the preparation and preservation of clarified cherry and apple juices are noted briefly. The rack and cloth type of press is recommended. The cherries, after washing, grading, and soaking, are crushed and heated to 150° F for pressing, the heat treatment serving to coagulate the pectin and thus permit of satisfactory clarification by filtering (after settling) in a home-made cloth-bag filter. Cold pressed juice, although better as to flavor, is less satisfactory as to color, and requires heating and treatment with pectinal enzyme before filtering. For apples cold pressing of the fresh fruit is recommended, the strained juice being treated with pectinal enzyme and after 5 hr. or more filtered with a cloth-bag filter with the use of Hyflo Supercel filter aid.

For preservation the juices are pasteurized by the holding or flash method and then sealed to exclude air. Glass containers or enamel cans may be used. Where freezing storage is available cherry and apple juices may be kept for long periods frozen at temperatures of 10° or lower.

The Montmorency cherry is the standard juice cherry, although blends of Montmorency, English Morello, and Black Tartarian are satisfactory. For beverage purposes the cherry juice is diluted, a sugar sirup being a satisfactory diluent for the sour juices. The Jonathan apple is recommended for an apple cider of rich body and full flavor, the Jonathan cider being satisfactory used alone or blended with juice from milder, sweeter apples which are too flat to use alone. The White Pearmain and Wealthy apples give good tart sweet ciders.

The chemical composition of foods, R. A. McCANCE and E. M. WIDDOWSON (*[Gt. Brit.] Med. Res. Council, Spec. Rpt. Ser. No. 235 (1940), pp. 150*).—These extensive tables present data on the proximate constituents and calorie value and on the mineral constituents and acid-base balance of a great number of fresh,

dried, canned, and cooked foods.. Notes on technic and some individual findings are given in the text, together with certain explanations of terms and conventions. In addition to the main tables, supplementary tables are included giving data on "available" (nonphytic acid) phosphorus, and on "available" (ionizable) iron in foods.

The analyses in the several tables were obtained over a period of 14 yr. in the course of work by McCance and associates at King's College Hospital, London. Some of the data have been published earlier, but many are here given for the first time. The values given for the composition of cooked dishes containing several ingredients do not represent analyses, however, but calculations based on the composition of the ingredients and the change in weight (determined) on cooking. The recipes for these cooked dishes are given.

Foods and public health, J. E. FULLER (*Massachusetts Sta. Bul. 373 (1940), pp. 16*).—This bulletin gives practical information about food-borne diseases classified as diseases spread by milk, including tuberculosis, typhoid fever, scarlet fever, septic sore throat, and undulant fever; food poisoning, including ptomaine poisoning, *Salmonella* food poisoning and food poisoning from staphylococcus and other bacteria; botulism; and trichinosis. Preventive or protective measures for each group are discussed, and a list of 26 literature references is given.

Food consumption in urban Puerto Rico [trans. title], S. DÍAZ PACHECO (*Puerto Rico Univ. Sta. Bul. 52 (1940), Span. ed., pp. 29, figs. 6; Eng. abs., pp. 28, 29*).—This report presents the results of a food consumption study based on 1,901 family schedules taken in 22 cities and towns in Puerto Rico. These families, representing about 14 per cent of the total population of these districts, averaged 6.2 persons per family with an average annual income of \$734. The results were compared with those from a similar study in San Juan (*E. S. R., 81, p. 808*).

One-fourth of the families in the 22 cities and towns bought 49 qt. or less of fresh milk per person per year, 30 percent bought from 50 to 99 qt., and 36 percent 100 qt. or over; 31 percent of the families consumed 99 eggs per person during the year, 32 percent from 100 to 249, and 21 percent 250 or over; only 18 percent of all families consumed over 61 lb. of beef per person during the year, 22 percent bought from 31 to 60, and 47 percent 30 lb. or less: plantains, tomatoes, sweetpotatoes, and yautias were also included in this analysis. With increase in income and also apparently with better education of the housewife the consumption of meats, fish, eggs, cheese, greens, tomatoes, plantains, and bread increased.

Distribution of foods in urban Puerto Rico [trans. title], S. DÍAZ PACHECO (*Puerto Rico Univ. Sta. Bul. 53 (1940), Span. ed., pp. 17, fig. 1; Eng. abs., pp. 15-17*).—The results of the distribution phase of the food consumption study noted above are given in the present report. In this the families are classified into income groups, the cities and towns into population groups, and within these groups an indication is given as to the importance of various distribution agencies. Street vendors, retail markets, small general stores, and special stores are the distribution agencies considered, and the food commodities are classified as minor crops, fresh beef and pork, chickens, fresh fish, fresh milk, eggs, and grocery goods.

The metabolism of carbohydrate and protein during prolonged fasting, W. H. CHAMBERS, J. P. CHANDLER, and S. B. BARKER (Cornell Univ.). (*Jour. Biol. Chem., 131 (1939), No. 1, pp. 95-109*).—In this study 11 adult mongrel dogs weighing between 9 and 22 kg. were observed during a prolonged fast with free access to water. Quantitative collection of the urine was begun at the intermediate stage of inanition after the dogs had lost 25-30 percent of

their original weights. The urine was analyzed to determine the excretion of total nitrogen, ketone bodies, creatinine, and creatine. Respiratory metabolism was determined at frequent intervals in the Lusk calorimeter. As the weight loss increased to about 50 percent, 7 of the 11 dogs exhibited the characteristic premortal rise in nitrogen metabolism. In these, designated as the "high-nitrogen" group, there was approximately a threefold increase in nitrogen excretion, a rise in the basal respiratory quotient to about 0.81, about a tenfold rise in creatinuria, and a definite fall in the ketone body excretion. These changes indicated a shift from the oxidation of stored fat as the source of energy, as characterizes the intermediate period, to oxidation of body protein in the premortal period.

In the 4 dogs designated as the "low-nitrogen" group, this characteristic shift was not observed, for the group maintained the low level of nitrogen excretion and high ketonuria, with basal respiratory quotients of about 0.73, and showed only about a five-fold increase in creatine excretion. Dogs of this latter group fasted for a much longer period before attaining the 50 percent loss in weight; this difference and the basal heat production of the animals suggested a greater store of fat in the low-nitrogen group. Moreover, with this group fat ingestion produced no effect on nitrogen excretion, whereas it exerted a marked nitrogen sparing effect in the high-nitrogen group. After fat ingestion, the metabolism of both groups resembled that of the intermediate fasting stage. The response to a glucose test meal was the same in both high- and low-nitrogen groups, the response being a rise in respiratory quotient to about 0.89, a fall in ketonuria, and small excretion of sugar, thus indicating partial restoration of the ability to oxidize glucose in this fourth phase of fasting metabolism. After the ingestion of meat normal respiratory metabolism and specific dynamic action were observed, although the ketonuria was increased.

The availability for growth of N-methyltryptophane administered as its acetyl derivative, W. G. GORDON, W. M. CAHILL, and R. W. JACKSON. (Cornell Univ. et al.). (*Jour. Biol. Chem.*, 131 (1939), No. 1, pp. 139-196, fig. 1).—Previous work having shown that *l*-tryptophan or, in lieu of preformed tryptophan, acetyl-*l*-tryptophan or *dl*-N-methyltryptophan, would support growth, the *l*-isomer of acetyl-N-methyltryptophan was tested. It was reasoned that if appreciable hydrolysis of this isomer occurred, then the resulting *l*-N-methyltryptophan should cause definite increase in the growth of test animals. Accordingly, male albino rats of about 100 gm. body weight were placed on a basal diet deficient in tryptophan but otherwise satisfactory. After the individual growth responses were established (about 6 weeks), the acetyl derivative to be tested was incorporated in the basal diet and fed for 4 weeks. Each animal served as its own control in subsequent periods when the basal diet was fed with or without a growth-promoting supplement of *l*-N-methyltryptophan. The diets were fed at libitum, the supplement in the control experiments being given at a level of 53.4 or 106.8 mg. per 100 gm. of basal diet, the lower level having been established as the minimum to produce unmistakable growth response; the supplement of acetyl-*l*-N-methyltryptophan was fed on an equivalent basis. In one experiment the test supplement was injected, as was also the control supplement, which in this case was the more soluble *dl*-N-methylamino acid.

From the individual growth curves and consumption records obtained in these experiments, it was apparent that the acetyl-*l*-N-methyltryptophan was not utilized for growth in the rats ingesting a diet deficient in tryptophan. Apparently, therefore, the substitution of the methyl group for the amide hydrogen of acetyl-*l*-tryptophan prevents its hydrolytic cleavage in the body.

The influence of diet on the endogenous production of citric acid, A. H. SMITH and C. E. MEYER (*Jour. Biol. Chem.*, 131 (1939), No. 1, pp. 45-55).—The experiments described were undertaken to obtain more definite information as to which of the major foodstuffs may give rise to urinary citric acid. Rats weighing about 200 gm were placed in individual metabolism cages and given one of four diets, the citric acid content of 3-day urine samples being then determined for a number of successive periods. The diets were represented by a standard ration containing amounts of carbohydrate, fat, and protein commonly used in adequate basic diets, and three other rations containing, respectively, an exaggerated quantity of protein (72.6 percent of purified lactalbumin), carbohydrate (58.6 percent dextrin), or fat (70.5 percent Crisco). The intakes of citric acid from the various diets were uniform and small, amounting at the most to no more than 60 mg. per rat per 3-day period.

In the first experiment involving three rats on each diet over four consecutive 3-day metabolism periods, citric acid production (calculated as urinary minus ingested citric acid) averaged 2.7 mg., 0.7, 13.3, and 10.7 mg. per rat per 3 days on the standard, protein, carbohydrate, and fat diets, respectively. In a second experiment of six metabolism periods, using other groups of rats, the corresponding averages were 21.9 mg., 3.9, 54.0, and 37.8 mg. per rat per 3 days. The greater excretion in the second experiment is attributable to the well-known effect of alkali on citric acid excretion, for in this experiment a different lot of lactalbumin with a higher alkaline value was used. Although rats on the same diet varied in their citric acid production and there was some overlapping between groups, still it was evident as indicated by the averages obtained that there were distinct differences between the different diets. These findings were confirmed in other experiments, using the original groups of test animals but interchanging the diets.

These studies give evidence, therefore, that the white rat has the ability to synthesize citric acid, and that diets containing the major portion of the energy either in the form of carbohydrate or fat favor the formation of citric acid more than those composed chiefly of protein.

Mineral metabolism, growth, and symptomatology of rats on a diet extremely deficient in phosphorus, H. G. DAY and E. V. McCOLLUM (*Jour. Biol. Chem.*, 130 (1939), No. 1, pp. 269-283).—Observations were made on 66 young rats as to the symptomatological and histopathological changes occurring upon a diet extremely deficient in phosphorus. Mineral balance studies were conducted on 7 rats, 3 of which were maintained on the phosphorus-deficient diet and 4 on the diet modified by the addition of adequate phosphate; of these 4, 1 was permitted to eat ad libitum while the other 3 were maintained as paired feeding controls. The present paper is concerned with the gross effects of the deficiency and with its progressive effects on the metabolism of Ca, Mg, Na, K, Cl, and N. The diet was composed of purified materials and contained only 0.017 percent of phosphorus but adequate amounts of other nutrients.

The young rats on the phosphorus-deficient diet grew slowly for 5-6 weeks, then declined, and died 2-3 weeks later. Extreme rarefaction of the skeleton quickly occurred, accompanied by progressive disability in walking, standing, and breathing. As observed in 2 rats in extreme deficiency, restoration of phosphorus to the diet brought about marked recovery. The metabolism of Na, K, and Mg appeared to be unaffected by the phosphorus deficiency, and the results on chlorides were equivocal. Nitrogen retention was positive for 5 weeks and then became negative as the animals began to lose weight. The changes in P and Ca metabolism were striking. There was a great loss of Ca, this loss being precipitous during the first 2 weeks; there was also loss of P, though

this was much less than the Ca loss. Apparently the P was withdrawn from the bones to be transferred to the soft tissues, where it was used with N for their growth. With rapid depletion of the P, however, there was no longer any growth of these tissues and the negative N balance ensued. With the mobilization of P from the bones, the Ca was released and this and Ca absorbed from the diet had to be excreted. The loss of Ca was principally through the urine, but most of the excreted P was in the feces. The results are discussed with relation to the conclusion of Schneider and Steenbock (E. S. R., 81, p. 884) that vitamin D induces P deposition in bone in preference to soft tissues when the dietary provides little P.

The sulphur content of foods, M. MASTERS and R. A. McCANCE (*Biochem. Jour.*, 33 (1939), No. 8, pp. 1304-1312).—Sulfur, expressed as milligrams per 100 gm. or per 100 cc. of fresh material (edible portion), is reported for about 300 foodstuffs of plant and animal origin, including fresh, dried, and canned fruits; fresh and cooked vegetables; cereals and starch products; dairy products; sweetmeats, jams, etc.; beverages, including a number of commercial (English) products and several beers; condiments; fats; sausages and meat and fish pastes; fresh and cooked meats; meat organs; fresh, cooked, smoked, and canned fish; and shellfish. For nearly all of the fruits, vegetables, and nuts, the determinations were made on the dried mixed samples analyzed for other constituents by McCance et al.⁴ A number of the food materials, notably cereals, were analyzed concurrently for other constituents by McCance and Widdowson (noted on p. 123). These publications may be consulted for data on other constituents, including moisture and nitrogen, for information on preparation and sampling of materials, and for scientific nomenclature. A few vegetables which it was thought might contain volatile or potentially volatile sulfur compounds were obtained as fresh samples and analyzed in the wet state. Flesh foods analyzed in this state were obtained as fresh samples, and moisture, sulfur, and nitrogen were determined. For scientific nomenclature of these foods, reference should be made to the study of McCance and Shipp.⁵ The results of the sulfur determinations are compared very briefly with those of other workers, and the N:S ratio is given some consideration.

Sulfur was determined in most cases by a hydrogenation method, although destructive oxidation of the organic matter with a nitric-perchloric acid mixture, followed by a gravimetric estimation of the resulting sulfates as BaSO₄, was used in some cases, particularly for the analysis of undried material. These methods are described in the study noted on page 8.

Body needs of iron given by legumes, leafy vegetables, O. SHEETS (*Miss. Farm Res. [Mississippi Sta.]*, 3 (1940), No. 8, pp. 1, 2).—This brief report, presented in popular form, outlines studies conducted to determine the suitability of green leafy vegetables and legumes as sources of iron for hemoglobin formation. The legumes—cowpeas, butter beans, pinto beans, and soybeans—gave better hemoglobin gains than the greens—mustard, collards, turnip tops, spinach, and lettuce. This was due in part, it was determined, to the adequate amounts of copper furnished by the legumes and in part to the greater availability of their iron, which was 90 percent available to the body as compared with 60-65 percent in the greens.

Influence of age upon the requirement of vitamin A, J. T. IYING and M. B. RICHARDS (*Nature [London]*, 144 (1939), No. 3656, pp. 908, 909).—Groups of litter mate rats were put on the authors, vitamin A-free diet (E. S. R., 82, p.

⁴ [Gt. Brit.] Med. Res. Council, Spec. Rpt. Ser. No. 213 (1936), pp. 107, figs. 26.

⁵ [Gt. Brit.] Med. Res. Council, Spec. Rpt. Ser. No. 187 (1933), pp. 146, figs. 36.

423) at weaning (23 days) and given doses of vitamin A varying from $\frac{1}{8}$ to 3 International Units daily. At the end of stated periods the rats were killed and their teeth examined for color and histological changes, the degree of which was assessed by an arbitrary scale. The negative controls showed the first abnormal signs after 30 days on the diet, these progressing with time. The longest survival on the vitamin A-free diet was 66 days. At this time the teeth of the negative controls were quite white, those receiving $\frac{1}{8}$ and $\frac{1}{4}$ I. U. of vitamin A a pale yellow, and those receiving 3 I. U. almost normal. As the experiment proceeded, the teeth of the rats on the higher doses faded progressively. After 105 days, the teeth of those on 1 and 1.5 I. U. of vitamin A were quite white, at 135 days those on 2 I. U. were completely colorless, and at 180 days those on 3 I. U. showed only a faint yellow tinge.

Slight histological changes were seen in the teeth of the animals receiving $\frac{1}{8}$ and $\frac{1}{4}$ I. U. and examined after 49 and 66 days, the others being normal. In a group killed at 52 days the teeth showed changes up to an intake of 2 I. U. daily. At 119 and 148 days the animals receiving 1 I. U. daily showed marked changes and in those killed after 180 days the teeth were not entirely normal even on 3 I. U.

The post-mortem findings checked closely with the color and histological changes. Of the animals killed up to 66 days, the negative controls showed the usual pathological changes such as keratosis of the stomach. Those on 1 or more I. U. of vitamin A per day were quite free of pathological change. In those killed after 52 days all showed some slight abnormality except the one receiving 3 I. U. All of the animals continued longer on the experiment had keratosis of the stomach, decreasing in severity with increased dosage of vitamin A.

These results are thought to furnish definite proof that the requirement of the animal for vitamin A increases with age. This is thought to be in line with the suggestion of Guilbert and Hart (*E. S. R.*, 74, p. 527) that the requirements of vitamin A are a function of body weight.

A study of diet in relation to health: Dark adaptation as an index of adequate vitamin A intake, II, III, A. M. THOMSON, H. D. GRIFFITH, J. R. MUTCH, D. M. LURBOOK, E. C. OWEN, and G. LOGARAS (*Brit. Jour. Ophthalmol.*, 23 (1939), Nos. 7, pp. 461-478, figs. 6; 11, pp. 697-723, figs. 7).—These two papers continue a series, the first paper* of which reported a preliminary study of a modification of the Edmund and Clemmesen method of assessing degrees of dark adaptation by measuring the power of distinction with a series of test letters ranging from black to nearly white over a wide light range.

II. A new photometer for measuring rate of dark adaptation.—The new adaptometer described, with technic for its use and discussion of its reliability, uses a single black test letter only (E or U) with a more sensitive type of light control and with measurements of light threshold only, involving no estimation of power of distinction between grays. A distinctive feature of the method is the use of a bleaching apparatus which consists of a metal bowl 2 ft. in diameter and 18 in. deep, lined with plaster of paris. The subject's head is supported on a chin rest on the lower edge of the bowl, and above his head is a "pearl" electric globe controlled by a variable resistance to give a steady light. The intensity of illumination of the surface of the bowl, as measured by a visually corrected photoelectric cell, has a value of 93 footcandles at the point directly opposite the eye position, diminishing to 88 footcandles 60° from the center. After preliminary dark adaptation, the subject undergoes a 4-min. bleaching period. In the opinion of

* A study of diet in relation to health: Dark adaptation as an index of adequate vitamin A intake.—Technique and preliminary results, J. R. Mutch and H. D. Griffith. *Brit. Med. Jour.*, No. 4002 (1937), pp. 565-570, figs. 9.

the authors, many of the inconsistencies reported in the use of dark adaptation methods are due to incomplete bleaching. Data are reported in proof of this point.

After the bleaching the test proper begins. This consists essentially in varying the intensity of the light by the use of a diaphragm with holes of graded size and recording the time taken before the subject sees the test letter and indicates its direction. In evaluating results obtained with the test, both the extent of illumination required as determined by the size of the aperture and the time required are taken into consideration.

III. *The relation of diet to rate and extent of dark adaptation.*—This paper reports the application of the Rowett adaptometer described in the preceding paper to the assessment of dark adaptation in various groups, the determination of standards of dark adaptation from data obtained on normal subjects known to be receiving ample vitamin A, the rates of dark adaptation in children on different diets, and the effect of vitamin A administration in individual cases. The results obtained in the above tests and the reported observations of others are compared. Various sources of error and factors affecting the tests are discussed, and the following conclusions are drawn:

"It would appear from our results that neither rate of dark adaptation nor light threshold of the fully dark adapted eye has necessarily a close correlation with intake of vitamin A in the diet. Considerable variation may occur in one individual and between individuals on the same diet. Clinical observations and experiments in vitamin A deficiency have shown that vitamin A and dark adaptation are related. But it seems that in certain cases at any rate the speed and extent of cure of hemeralopia by vitamin A concentrates are subject to considerable variation. The majority of workers believe that the study of dark adaptation can be used as a test for vitamin A deficiency, but until differences in technic and interpretation of results have been resolved, it is impossible to be certain how far their recorded observations represent physiological facts."

An extensive bibliography is appended.

Vitamin A deficiency: Its prevalence and importance as shown by a new test. L. B. PERR (*Jour. Lab. and Clin. Med.*, 25 (1939). No. 2. pp. 149-160, figs. 4).—The rapid test described, with photograph and working diagram of the apparatus employed, depends on the recovery time after looking at a bright light, the test object being a rectangle or bar of dim light which is seen vertically or horizontally. Following a 30-sec. exposure to bright light during which the subject looks at a black spot marking the position where the bar of dim light will appear later, the bright light is turned off, and the subject says "up" or "across," indicating the direction of the bar at the moment when it becomes visible. A recovery time of 11 or more seconds is considered to indicate deficiency in vitamin A. Normality with respect to vitamin A is ascribed to anyone who does not show a change in recovery time after a single 50,000 International Units dose of vitamin A and who has no evidence of vitamin deficiency.

"Proof of the test's relation to vitamin A has been given by (1) a report of experimentally induced vitamin A deficiency, correlating the test with other signs; (2) the prolonged recovery times observed in people with liver disease (cirrhosis or diabetes) or on special diets whereby they either do not receive the vitamin or do not convert it from carotenoids; (3) the recovery on treatment with vitamin A of some 200 cases classed as deficient; and (4) subjective improvement in many such cases. The effects on the test of sex, age, color of eyes, myopia, hyperopia, astigmatism, wearing of spectacles, and fatigue are negligible, since great accuracy is not demanded. The size of pupil, disparity of vision of the two eyes, and diseases might have an effect."

Of the 1,600 or more people examined, 52 percent were found deficient in vitamin A by the criteria employed, the highest percentage in any group. 64 percent, being among single men from 20 to 35 yr. of age on relief. In a comparison of 303 normal and 360 deficient subjects, higher percentages of the deficient than of the normal subjects, were found to be suffering from various conditions, including night blindness, eyestrain and photophobia, dry conjunctiva, dry skin, dry nasal mucosa, scanty saliva, and frequency and duration of colds.

Photometric measurements on visual adaptation in normal adults on diets deficient in vitamin A. L. F. STEFFENS, H. L. BAIR, and C. SHEARD (*Mayo Found. Med. Ed. and Res., Proc. Staff Mtgs. Mayo Clinic, 14 (1939), No. 44, pp. 698-704, figs. 3*).—For the apparatus described two adjoining lightproof rooms were used. In one were placed the person being tested, the small light with red filter which served as the fixation target, and the area which on illumination acted as the source of retinal stimulus. In the other room were placed a bench with sliding head carrying a small lamp which on being moved toward the subject caused an increase in the intensity of light falling on the retinal stimulus target. The threshold intensities in micromillilamberts were determined by suitable calibration. In the use of the apparatus the subject's right eye was light-adapted for 3 min. by looking at the screen uniformly illuminated with a light of 160 footcandle intensity. The adapting light was then turned off, the subject looked at the fixation light, and the operator moved the light source slowly toward the subject until the light on the target was seen. The time elapsing from the beginning of the dark adaptation period, the position of the light source on the optical bench, and the value of the light transmitted by the filter used were recorded.

Three subjects on a diet with adequate provision for protein, calcium, phosphorus, iron, and vitamins other than A and with the A intake restricted to from 100 to 300 International Units daily were tested at intervals during periods of 44, 160, and 190 days, respectively. Determinations of the light sensitivity were made at intervals of $\frac{1}{2}$ –2 min., with alternate readings for the macular and paramacular (10° above macula) regions. The readings were continued after the resumption of an ordinary diet supplemented with 80,000 units of vitamin A. In the two subjects who remained longest on the deficient diet the light thresholds of both regions were increased by only 0.5 logarithmic unit in 3 mo., a change considered insufficient to warrant concluding that there was any evidence of vitamin A deficiency. This was further borne out by a tendency of the light threshold to decrease gradually to the normal level at the beginning of the experiment and to be practically unaffected by subsequent increases in vitamin A intake. Comparable and in some cases almost identical values were obtained with the biophotometer.

Microscopic examination of sections of the skin of one of the subjects showed that after 190 days changes characteristic of the late stages of avitaminosis appeared. These are described as "hyperkeratosis, keratotic plugging of the hair follicles, atrophy of the sebaceous glands, and perivascular infiltration in the upper cutis." A repetition of the test 17 days after treatment with vitamin A showed restoration to normal conditions except for keratotic plugs in the hair follicles. As the skin changes antedated appreciable changes in light sensitivity, the authors suggest the possibility that "normal values of light sensitivity may be maintained over considerable periods of time through the utilization of carotene and vitamin A previously deposited in the skin and fatty tissues, and that the minimal requirements of these substances for proper visual function may be much less than has heretofore been believed."

Thyroxine and hypervitaminosis-A, C. A. BAUMANN and T. MOORE (*Biochem. Jour.*, 33 (1939), No. 10, pp. 1639-1644, fig. 1).—The conflicting literature on the question of the interrelationship of vitamin A and thyroxine is reviewed briefly, and new experimental evidence on rats is reported, indicating that when both vitamin A and thyroxine are administered in doses so large as to be toxic but not rapidly fatal, no interrelation could be established.

The effect of large doses of thyroxine was first studied in 1-year-old stock female rats which had high reserves of vitamin A at the beginning of the experiment. The animals were divided into four groups which received, respectively, a low vitamin A diet plus an excess of vitamin A (5 mg daily), the same plus 0.6 mg. of thyroxine injected subcutaneously 3 times a week, the basal diet alone, and the basal diet plus thyroxine. All animals receiving either thyroxine or excess of vitamin A or both showed decreased food intake and loss of weight, greater for the animals receiving both supplements than one alone. The decreased food intake by the animals receiving thyroxine was followed after 10 days by a sudden increase, which was not duplicated by the animals receiving only the basal diet alone or with vitamin A. The animals receiving thyroxine alone or vitamin A alone survived the 6 weeks of the experiment. All those receiving vitamin A and thyroxine died between the fourteenth and nineteenth days.

A second series of similar tests was run on young rats 4 weeks of age at the beginning of the experiment, with similar results.

Keratoconus experimentally produced in the rat by vitamin A deficiency, J. R. MUTOH and M. B. RICHARDS (*Brit. Jour. Ophthalmol.*, 23 (1939), No. 6, pp. 381-387, fig. 1).—Keratoconus is defined as a condition of the eye in which the central portion of the cornea bulges forward in the form of a cone without any sign of inflammatory symptoms. In the study reported, it was produced in rats in which acute xerophthalmia had developed on a vitamin A-deficient diet and allowed to progress until the cornea showed a central haziness, at which time the animals were given concentrated doses of vitamin A. The stage at which the vitamin A was administered determined whether or not the keratoconus followed. When the vitamin was given too early the eyes cleared up rapidly, leaving no apparent abnormality, while if treatment was delayed too long the eye perforated. "In cases where keratoconus developed the sequence of the symptoms was as follows: By the second day following the administration of vitamin A the discharge had become much less, the eyes were partly open, and the cornea showed a central protrusion. This protrusion increased and came to a point. It took on an average 10 days for the cone to reach a maximum size." In most cases the cornea regained its normal shape after a few weeks dosing with vitamin A, although corneal nebulae and myopia remained as permanent defects.

Studies of the vitamin B complex: Further studies of vitamin B₁ deficiency, W. D. SALMON (*Alabama Sta. Rpt.* 1938, p. 16).—In this progress report (*E. S. R.*, 81, p. 140) the effectiveness of various substances in the cure of vitamin B₁ deficiency is noted.

Observations on the vitamin B₁ excretion of four healthy subjects living on different Indian diets, R. C. GUHA and B. AHMAD (*Indian Jour. Med. Res.*, 27 (1939), No. 2, pp. 465-469).—The urinary excretion of vitamin B₁ by four healthy subjects on diets typical of different sections of India was determined by the rat growth method on Lloyd's reagent adsorbates of the urine prepared by the method of Harris and Leong (*E. S. R.*, 76, p. 425). The daily output of vitamin B₁ of these subjects on their customary diets ranged from 84 to 228 μ g. (28-96 International Units), which represented from 5.9 to 19 percent of the estimated intake. When the vitamin B₁ content of the diets was decreased without lowering the calorie content by replacing home-pounded and half-milled rice by polished

rice and atta by white flour, both the total and the percentage outputs of vitamin B₁ were decreased. Three of the subjects then returned to their original diets and were given supplements of vitamin B₁ in the form of a clay adsorbate of rice polish furnishing 600–1,200 μ g. of vitamin B₁. Four days were required for one of the subjects and 3 for another to reach approximately the initial level of excretion. The third subject, tested only on the second day, had not reached the initial level at that time.

Attention is called to the agreement of the results in this study with the observations of Harris and Leong except that the daily output was higher in the present study than of normal subjects in the Cambridge study. "The amount of vitamin B₁ excreted in the urine depends upon the dietary intake and the previous dietary history of the subject. It represents, however, a small percentage of the total intake. When the intake is low, the percentage excretion is lower than that on a high vitamin intake. This might be a physiological adjustment on the part of the organism to conserve the stores in the face of a declining supply."

Processing and thiamin. A. ARNOLD and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Food Res.*, 4 (1939), No. 6, pp. 547–553, figs. 3).—The thiamin content of certain meats and meat products processed in 1-lb. tins was determined by the chick assay procedure (E. S. R., 79, p. 872), with unprocessed vacuum-dried samples as controls. The control sample of beef kidney contained 5 International Units or 15 γ of thiamin per gram, dry basis, and the sample processed for 2 hr. at 115.6° C. only 8 γ . Corresponding values for beef lung tissue were 6 γ and less than 1.5 γ , and beef spleen 6 γ and 1.7 γ per gram, respectively. Hog muscle contained 20 γ of thiamin per gram in the vacuum-dried sample and less than 4 γ after processing for 1 hr. 50 min. at 121° C. A meat product containing a small amount of cereal grains furnished 5 γ of thiamin per gram in the control sample, and 2 γ , 1.7 γ , 1.5 γ , and less than 1 γ per gram after processing 1 hr. at 240° F., 1 hr. 30 min. at 240°, 2 hr. at 240°, and 1 hr. 50 min. at 250°, respectively. The results show that processing under the conditions followed is very destructive of thiamin, and that increase in temperature is somewhat more destructive than increase in time.

The utilization of certain sulfur-containing compounds for growth purposes. W. C. ROSE and E. E. RICE. (Univ. Ill.). (*Jour. Biol. Chem.*, 130 (1939), No. 1, pp. 305–323, figs. 4).—Four compounds, *dl*-homocystine, *dl*-homocysteine, the thiolactone of *dl*-homocysteine hydrochloride, and *l*-cysteine hydrochloride, prepared by methods described, were tested for their growth-promoting effects in young rats. The compounds were fed, respectively, as supplements to a basic diet in which the nitrogenous portion of the food was furnished in the form of a mixture of highly purified amino acids; the mixture excluded both cystine and methionine and likewise the nonessential (to the rat) acids norleucine, hydroxyglutamic acid, and citrulline. For control purposes, like experiments were conducted with cystine and methionine as the respective supplements, the latter compound promoting rapid growth, the former permitting a decline in weight. The diet contained in all cases an adequate supply of minerals and vitamins, the vitamin B factors being furnished in two different forms in successive experiments.

The *l*-cysteine hydrochloride failed to improve the nutritive quality of the basic diet, permitting a decline in weight at a rate comparable to that which occurred when cystine was furnished in the absence of methionine. The effects of homocystine, homocysteine, and the thiolactone of homocysteine hydrochloride were found to depend on the nature of the vitamin B supplement. When the B factors were supplied in the form of tikitiki and milk concentrate, either of the three amino acids permitted growth, although at distinctly subnormal rates as evidenced by the growth curves and weight data presented.

Bare maintenance or even loss of weight occurred with either of the three amino acids when the vitamin B factors were supplied as the crystalline vitamins plus ryzamin-B, the form adopted by Du Vigneaud et al. in the study noted below. It is considered, therefore, that the ability of the organism to synthesize methionine out of the compounds in question is facilitated to a greater extent by one type of vitamin B supplement than by the other.

A relationship between the nature of the vitamin B complex supplement and the ability of homocystine to replace methionine in the diet, V. DU VIGNEAUD, H. M. DYER, and M. W. KIES. (Cornell Univ. et al.). (*Jour. Biol. Chem.*, 130 (1939), No. 1, pp. 325-340, figs. 2).—This investigation, an outgrowth of a study to determine the mechanism of conversion of methionine and homocystine into cystine in the animal body, was undertaken when it became evident that the nature of the vitamin B supplement might influence the ability of homocystine to substitute for methionine.

In growth studies with young rats, homocystine as a dietary supplement or homocysteine injected subcutaneously was administered to animals on a basic diet in which the nitrogenous constituents were supplied by an amino acid mixture (20.4 parts) devoid of methionine and cystine and almost identical with the one used by Rose et al. in the study noted above; dextrin 27.0, sucrose 15.0, lard 26.0, cod-liver oil 5.0, agar 2, and salt mixture 4 parts completed the diet. The vitamin B factors were supplied by a daily supplement per rat of 0.02 mg. of crystalline thiamin chloride, 0.02 mg. of riboflavin, and 0.02 mg. of nicotinic acid, with 25 mg. of ryzamin-B (an aqueous acetone extract of rice polishings) as a source of the other B factors. With this regime neither the homocystine nor the homocysteine was capable of supporting growth of the animals; at autopsy they showed fatty infiltration of the liver. With the same basal diet but with the vitamin B factors supplied by tikitiki and milk vitamin concentrate (as used by Rose et al.), homocystine was found to support growth. Apparently, therefore, some factor (or factors) was present in the tikitiki and milk vitamin concentrate, but lacking or present in insufficient amounts in the mixture of purified vitamins and ryzamin-B, which made possible the utilization of homocystine by animals on a methionine-deficient diet.

Studies on the metabolism of pyruvic acid in normal and vitamin B₁-deficient states, IV-VI (*Biochem. Jour.*, 33 (1939), No. 10, pp. 1525-1537, fig. 1; pp. 1538-1543, figs. 2; pp. 1544-1548).—In continuation of the series noted previously (E. S. R., 83, p. 133), three papers are presented.

IV. The accumulation of pyruvic acid and other carbonyl compounds in beriberi and the effect of vitamin B₁, B. S. Platt and G. D. Lu.—Data are reported on the quantities of bisulfite-binding substances (B. B. S.), particularly pyruvic acid, in the blood, cerebrospinal fluid, and urine of adult subjects, most of whom were in various stages of vitamin B₁ deficiency. For purposes of comparison some observations were also made on apparently healthy persons and on B₁-deficient subjects, including some cases of fulminating beriberi, following the administration of vitamin B₁. A few samples of human milk from normal Chinese and British women and from Chinese women in a state of subacute vitamin B₁ deficiency were analyzed for pyruvate.

A group of 60 subjects classified with respect to beriberi as resting or cured gave blood pyruvic acid values ranging from 0.4 to 0.75 mg. per 100 gm.; of 12 after adequate dosage of vitamin B₁, 3 gave cerebrospinal pyruvic acid values less than 0.4, 6 between 0.4 and 0.55, and 3 between 0.70 and 0.75 mg. per 100 gm. In an earlier study blood B. B. S. values (calculated as pyruvic acid) for 23 apparently healthy Chinese subjects ranged from 2.22 to 4.8 mg. per 100 gm., with a mean of 3.27 and standard deviation of 0.70. In comparison with

these figures pyruvic acid blood values in subacute beriberi ranged from 0.17 to 1.93, with a mean of 0.93 mg. per 100 gm., and B. B. S. from 2.7 to 7.3, with a mean of 4.5; pyruvic acid in cerebrospinal fluid from 0.41 to 1.32, with a mean of 0.72, and B. B. S. from 1.8 to 4.2, with a mean of 2.81 mg. per 100 gm. The number of cases in the four groups were 84, 65, 30, and 25, respectively. In acute beriberi the values were all much higher; the means for the four items being 2.72, 10.1, 1.69, and 3.7 mg. per 100 gm., respectively. Data for 4 cases of fulminating beriberi, cured by vitamin B₁ in amounts ranging from 40 to 5 mg., were obtained at intervals during recovery. Initial blood pyruvic acid values ranged roughly from 3 to 5 mg. per 100 gm. and were reduced to from 1 to 2 mg. per 100 gm. 5 hr. after treatment. In 3 of the 4 cases there was a lag of 3 or 4 hr. before a sudden fall. Pyruvic acid values for human milk ranged from 0.1 to 0.24, with a mean of 0.16 mg. per 100 gm. for 8 normal Chinese women, from 0.12 to 0.26, with a mean of 0.18 mg. per 100 gm. for 3 normal British women, and from 0.34 to 0.53, with a mean of 0.41 mg. per 100 gm. for 5 Chinese women in a state of subacute vitamin B₁ deficiency.

In discussing these findings the possibility is recognized that pyruvate accumulation is specific for vitamin B₁ deficiency only insofar as there is a derangement in intermediate carbohydrate metabolism. Concerning the fact that the increases in B. B. S. are greater than can be accounted for by the increase in pyruvic acid, three possibilities are suggested. "They may be products of deranged metabolism due solely to insufficient amounts of vitamin B₁; they may be derived from pyruvic acid or, thirdly, they may be the products of some associated deficiency or other metabolic error."

V. *The effect of exercise on blood pyruvate in vitamin B₁ deficiency in man*, G. D. Lu and B. S. Platt.—The exercise in this study consisted either of sitting up and lying down in bed without assistance 20 times in a 45-sec. interval, or climbing 100 steps 5 times in from 8 to 10 min. Blood was taken for analysis at rest, immediately after exercise, and at the end of ½ hour's rest following the exercise. The subjects thus tested included 13 patients cured of beriberi, 2 of whom were tested twice, and 5 subacute cases tested before and after treatment with vitamin B₁ by intravenous injection. In the cured cases the pyruvic acid values for the most part showed an increase immediately after the exercise, but dropped back to approximately the original levels ½ hr. later. Following treatment with vitamin B₁, light exercise did not consistently increase the blood pyruvate levels, and such B. B. S. value increases as were noted disappeared by the end of the ½ hr. period. They showed no consistent change. Detailed accounts of 2 typical examples of acute beriberi showing effects of vitamin B₁ injections on blood pyruvic acid, and B. B. S. values before and after light and heavy exercise, are also reported, with similar data on normal and cured subjects. These indicate that when the changes of blood pyruvate are inconsiderable, marked increases accompanied by clinical symptoms resembling those of fulminating beriberi may follow heavy work, but that still heavier work may be tolerated by subjects not deficient in vitamin B₁ and without appreciable increases in blood pyruvate values. B. B. S. values were increased when the blood pyruvate was markedly increased, but to an extent that could not be accounted for solely by increase in pyruvic acid. Increase in pyruvic acid excretion after exercise was also noted.

It is considered probable that increased muscular work is only one of a number of factors capable of increasing the requirement for or deficiency of vitamin B₁ through their contribution to the increase in metabolic activities in which this vitamin is involved. It is suggested that exercise may be used to reveal latent vitamin B₁ deficiencies, but that exercise tests may be limited by the subject's inability to engage in heavy effort. "In view of this it is suggested that a modifi-

cation might be based on the determination of blood changes following a measured amount of work in a limb in which venous return is obstructed. In view of the possible association of fatigue, vitamin B₁ deficiency, and exercise this test might well be combined with observations of the development of sensations of pain in the exercised limb."

VI. *The fate of injected pyruvate in the normal rabbit*, G. D. Lu and D. M. Needham.—Rabbits were loaded with definite amounts of pyruvate by intravenous injections lasting for from 1 to 2 min., and blood samples were taken for analysis of total reducing sugar, fermentable sugars, nonglucose substances, pyruvic acid, and lactic acid before and immediately after the injection and 8, 20, and 30 min. later. The injection of small doses, 150 and 200 mg., of pyruvic acid gave rise to a temporary increase in nonglucose substances and lactic acid, followed by a more marked increase in the fermentable sugars as the nonglucose-reducing substances returned to resting levels. Analyses of lactate and pyruvate changes in the muscles and blood of rabbits after injections of 340 and 550 mg. of pyruvate are also reported. Only from 2 to 3 percent of the total injected pyruvate was retained by the muscles. In 30 percent of the cases significant lactate increase occurred in the muscles and in all cases a lactate increase in the blood. In samples from 2 rabbits a possible change in various phosphate fractions was sought but not found.

These findings are thought to suggest that the ability to rebuild carbohydrate from lactate and pyruvate is "one of the factors in the organism limiting the efficiency of pyruvate removal. The well-known decrease of glycogen content in the tissues, the similar small increase of pyruvate accompanied by a much larger increase of lactate in the blood, and the delayed removal of these after exercise in avitaminous animals appear to indicate that vitamin B₁ may play an important role in the anabolism as well as the catabolism of glycogen."

Vitamin C content of vegetables.—XII, Broccoli, cauliflower, endive, cantaloup, parsnips, New Zealand spinach, kohlrabi, lettuce, and kale, K. WHEELER, D. K. TRESSLER, and C. G. KING (N. Y. State Expt. Sta. et al.). (*Food Res.*, 4 (1939), No. 6, pp. 593-604).—The vitamin C content was determined by titration, and checked for most of the samples by biological assay. For the cauliflower, broccoli, endive, lettuce, parsley, and New Zealand spinach a mixture of 5 percent sulfuric acid and 2 percent metaphosphoric acid was used in the extraction; for cantaloups and parsnips an 8 percent acetic acid and 2 percent metaphosphoric acid mixture, and for kale an 8 percent trichloroacetic acid and 2 percent metaphosphoric acid mixture. The vegetables were tested fresh from the field and after storage at different temperatures for different lengths of time. The effect of variety, portion of the plant, and maturity was also tested with some of the samples.

The average ascorbic acid values of the edible portion of the freshly harvested vegetable are given as parsley 2 mg. per gram, broccoli 1.3, kale 1.3, cauliflower 0.9, kohlrabi 0.65, New Zealand spinach 0.45, parsnip 0.40, cantaloup 0.35, lettuce 0.15, and endive 0.14 mg. per gram. Varietal differences were slight for the four varieties of broccoli, cauliflower, and endive tested. The five varieties of lettuce tested and their ascorbic acid content were California Iceberg 0.10, Mignonette 0.11, White Boston 0.13, Salamander 0.14, and Black Seeded Simpson 0.21 mg. per gram; and the six varieties of cantaloup Bender Surprise 0.23, New Wonderful 0.24, Cooper Sweetheart 0.25, Aristocrat 0.37, Golden Marvel 0.38, and Honey Rock 0.48 mg. per gram. Broccoli had a higher ascorbic acid content in September than in July, with averages of 1.64 and 1.19 mg. per gram, respectively, and at the same season a higher content in the blossoms than in the stems (July values 1.46 and 1.09 mg. per 100 gm., respectively).

Cauliflower blossoms were also richer in ascorbic acid than the stems, with values of 1.03 and 0.90, respectively, for the July samples. When held at room temperature in the summer, broccoli, cauliflower, endive, kale, lettuce, and New Zealand spinach lost ascorbic acid rapidly. Refrigeration effectively retarded the losses for broccoli, cauliflower, and endive, but not so effectively for lettuce and kale. The ascorbic acid content of parsnips kept in a pit during the winter at temperatures slightly above freezing decreased from 0.400 mg. per gram in November to 0.149 mg. in March. The losses were still greater at a higher temperature, 44.6° F., and the parsnips were also in a much poorer condition.

The concentration of vitamin C in the blood during and after pregnancy. A. SADOVSKY, D. WEBER, and E. WIRTHEIMER (*Jour. Lab. and Clin. Med.*, 25 (1939), No. 2, pp. 120-131).—The first part of this report deals with the theoretical aspects of vitamin C metabolism and behavior in the blood and urine and the second with results of vitamin C determinations in the blood of women (nonpregnant, pregnant, and post-partum). In the opinion of the authors "the surest method of determining an actual vitamin deficiency in contradistinction to a mere reserve deficiency is provided by assaying the concentration of vitamin C in the blood." A concentration of 0.78 mg. percent is considered normal, although this must be raised to 1.4 mg. percent before excretion can occur, the latter concentration being the threshold saturation level. The validity of values for blood obtained by indophenol titration according to the Farmer and Abt method was shown by the practically complete reduction of reducing properties of blood serum and plasma by the action of a cucumber juice extract which catalyzes the oxidation of ascorbic acid. The stability of the vitamin in blood samples was tested, with the conclusion that it is greatest at neutral or weakly alkaline pH and least at pH 5. No method of inhibiting the residual autoxidation could be found, although deproteinization by metaphosphoric acid is recommended as inhibiting the action for several hours.

The average vitamin C concentration in the blood of 322 women was found to be 1.01 mg. percent. Of these subjects, 207 pregnant women gave an average value of 1.09 mg. percent, 62 post-partum 0.79, and 47 nonpregnant 0.98 mg. percent. Insignificant differences were found in the vitamin C content of the blood of pregnant women with teeth in good, medium, or bad condition, and the concentration of calcium and phosphorus was likewise found to be independent of the condition of the teeth. In 43 pregnant women suffering from gingivitis, the vitamin C content of the blood was normal, averaging 1.18 mg. percent, and in 7 with gingivitis complicated with caries slightly below normal, averaging 0.9 mg. percent.

The concentration of vitamin C in human milk during the first 9 days after confinement was determined in a total of 147 tests for 62 women. Values rose from an average of 2.63 mg. percent on the first day to 5.52 mg. percent on the eighth day, with calculated daily totals of 2.44 and 27.0 mg., respectively. There appeared to be no definite correlation between the vitamin C content of the milk and the blood of the same subject or between the age of the mother, number of children born previously, and weight of the new-born infant and the concentration of vitamin C in milk and blood. An arrangement of the blood values by month showed markedly higher values during the citrus season.

Some effects on guinea pigs of feeding vitamin C intermittently. M. T. HARMAN and A. MILLER. (*Kans. Expt. Sta.*). (*Kans. Acad. Sci. Trans.*, 42 (1939), pp. 445-449).—In continuation of studies noted previously (*E. S. R.*, 80, p. 429), the effects of intermittent vitamin C feeding either as ascorbic acid or greens on the pathological changes in jaw bones, cheek teeth, and incisors of guinea pigs, as well as their general nutritive condition and incidence and

severity of scurvy, were observed in 47 guinea pigs, male and female and of different ages, with the conclusion that for normal growth and best physiological conditions a liberal amount of vitamin C should be included in the diet regularly, but that animals can be deprived of vitamin C for a short time and still live. On resumption of vitamin C, some animals seem to recover fully while others do not. Individual differences in the degree of resistance to the lack of vitamin C were apparent in the animals studied, suggesting that "the degree of resistance to an attack of scurvy is an individual factor." and that "although there is a chance for recovery from a pronounced case of scurvy produced by a limited amount of vitamin C, there is probably a greater chance for death."

Influence of fever therapy on blood levels and urinary excretion of ascorbic acid. K. DAUM, K. BOYN, and W. D. PAUL (*Soc. Expt. Biol. and Med. Proc.*, 40 (1939), No. 1, pp. 129-132).—In a group of seven patients receiving fever therapy electrically induced and with temperatures of 105°-106° F. maintained for 2-5 hr. during the treatment at 1- to 3-day intervals, analyses for ascorbic acid of blood samples drawn before and after the heat therapy and during the intervening days and of repeated 24-hr. urines showed consistent decreases in the blood and urine ascorbic acid values, with two exceptions in the urine values following the treatment. Comparison was also made of blood and urine values following a test dose of 500 mg (700 for one subject) in five normal subjects, five pathological subjects (cardiac (two), obesity, tuberculosis, and arthritis), and five of the fever therapy cases. The blood levels in the three groups showed similar variation, but the normal subjects excreted from 17 to 40 per cent of the ingested dose and the pathological and fever therapy subjects from 2 to 5 percent (with one exception in the fever therapy cases of 14 percent). It is concluded that the decreased excretion in the urine, as found in this study and as reported for infectious cases with fever, is due to the increased temperature rather than to an invading organism.

Studies in mineral metabolism with the aid of artificial radio-active isotopes.—III, The influence of vitamin D on the phosphorus metabolism of rachitic rats, W. E. COHN and D. M. GREENBERG. (Univ. Calif. et al.). (*Jour. Biol. Chem.*, 130 (1939), No. 2, pp. 625-634).—Groups of rachitic rats were separated into uniform subgroups of three animals each. After 3 hr. of fasting, one subgroup received an oral dose of 0.1 cc. of viosterol (10,000 U. S. P. XI units per gram); 1 hr. later all animals received an oral (stomach tube) or an intraperitoneal dose of a solution of Na_2HPO_4 (0.25-1.0 cc. containing 0.5-2.2 mg. P) containing from 2,000 to 5,000 units of radioactive P. The rats, then placed in individual cages having urine-feces separators, were permitted food after 1 hr. and were killed with chloroform after an interval of 64-80 hr. Samples of muscle (from hind leg) and bone (femur and tibia) were taken and these, as well as the remaining carcass, urine, and feces, were analyzed for radioactive phosphorus (P^{32}) and total phosphorus (P^{31}). In certain bone samples these phosphorus determinations were made separately on the lipoid (alcohol-ether extract), organic (KOH-glycerol extract of fat-free bone), and inorganic (ash of extracted bone) portions. From the various analyses the excretion and the net absorption of P^{32} , the retention of P^{32} by the muscle, and the distribution of the absorbed P^{32} in the bone were calculated for animals with and without vitamin D treatment. The results are expressed as percentage of the amount of radioactive phosphorus injected or absorbed.

The values obtained indicated that the net absorption of phosphates by rachitic rats was increased by only 10-15 percent by vitamin D; this small increase in net absorption was due to increased absorption from and decreased

reexcretion into the gut. The urinary phosphorus excretion was so low in the rachitic rats that no effect of the vitamin D administration could be demonstrated. The vitamin D appeared to cause a slight drop in the uptake of absorbed phosphorus by the muscle. In the case of bone the vitamin D caused a 25-50 percent increase in the inorganic phosphorus uptake, apparently at the expense of the most recently ingested phosphorus, but produced little increase in the organic phosphorus. In this organic portion, however, the $P^{22} : P^{32}$ ratio was raised by vitamin D, the ratio being higher than in muscle or total viscera and as high as in urine. Apparently, therefore, the exchange of phosphorus between blood and the organic matter of bone was more rapid in muscle and preceded in time the deposition of inorganic P^{32} in the bone. On the basis of this indirect evidence it is considered that the vitamin D acts to aid the conversion of organic to inorganic phosphorus, and that the transfer of phosphorus from the blood to the organic fraction of bone is independent of vitamin D.

A comparison of cereal and non-cereal diets in the production of rickets, J. H. JONES (*Jour. Nutr.*, 18 (1939), No. 5, pp. 507-516).—In this study rolled oats, wheat, and yellow corn were compared with each other and with noncereal diets in their ability to promote calcification in the rat. The cereals and the dextrinized cornstarch and the cane sugar used in the several diets were incorporated at a 70- or 75-percent level as supplements to a basal mixture previously described (*E. S. R.*, 81, p. 879) and consisting of alcohol-extracted fibrin, carotene, and a salt mixture complete except for calcium and phosphorus, which were variables. The diets were fed in several series of experiments to rats taken at about 25 days of age and observed for evidences of rachitogenic action of the diets; daily food consumption and weight gains were observed and serum calcium and phosphorus and femur ash were determined.

In the first experiments when the calcium of the diet was high (CaCO_3 , 3 percent) and the phosphorus low (0.86, 0.31, 0.26, 0.09, and 0.09 percent in the oats, wheat, corn, dextrin, and sucrose diets, respectively), the rolled oats and wheat produced more calcification than did corn or either of the noncereal diets. When the CaCO_3 was reduced to 1 percent there was an increase in calcification on all of the cereal diets but not on the dextrin and sucrose diets. Similar results were obtained when the CaCO_3 was omitted entirely, although the difference in calcification between the cereal and noncereal diets was less.

Without the addition of CaCO_3 the diets contained from 0.05 to 0.08 percent of calcium; at this low level, with calcium the limiting factor, an addition of phosphorus (0.5 percent) produced no detectable difference in the calcification produced on any of the diets. In none of the experiments was evidence obtained to support the view that cereal grains contain a specific anticalcifying factor.

Studies on experimental rickets in rats.—III, The behavior and fate of the cartilage remnants in the rachitic metaphysis, G. S. DODDS and H. C. CAMEBON. (W. Va. Expt. Sta.). (*Amer. Jour. Pathol.*, 15 (1939), No. 6, pp. 723-740, pls. 2, figs. 2).—Earlier studies in this series dealt with structural modifications of the epiphyseal cartilages in the tibia and other bones and with the healing process in the head of the tibia and other bones (*E. S. R.*, 81, p. 747). The present study is concerned with the behavior and fate of the cartilage remnants, as observed in experimental rats, during active rickets and during the healing process. The changes observed are described in detail and illustrated with photomicrographs and drawings. In the rachitic metaphysis there was observed (1) an osteoid envelopment of cartilage, considerable osteoid being deposited on the surfaces of the cartilage remnants, and (2) an osteoid infiltra-

tion of cartilage in which osteoid was deposited in the opened lacunae near the surface of the cartilage remnants by the osteoblasts from the adjacent bone marrow. These two changes affected the surface cells of the cartilage trabeculae, and the two types of tissue were direct products of the marrow.

The third change, observed in the deeper cells of the cartilage remnants, involved mitotic division of the cartilage cells and metaplasia into an osteocyte-like form. In the unopened lacunae about these cells and as a product of their activity there was deposited an uncalcified osteoid matrix. During this internal reorganization process the matrix of the cartilage was not changed. It persisted to become calcified during the healing of rickets and to serve as a base for the deposition of bone in the formation of the trabeculae of the restored bone.

Antihemorrhagic activity of simple compounds, M. TISHLER and W. L. SAMPSON (*Jour. Amer. Chem. Soc.*, 61 (1939), No. 9, pp. 2563, 2564).—The activity of 2-methyl-1,4-naphthoquinone was reinvestigated (its minimum dose was not determined in the previous study by Fieser et al. (*E. S. R.*, 83, p. 15)) by an assay method noted briefly. From the results of the assay on over 120 chicks, using levels of 0.5γ–1.0γ, it is concluded that this compound has an antihemorrhagic activity of the same order as that reported for vitamin K₁ by Thayer et al. (*E. S. R.*, 82, p. 59). This confirms the findings of Ansbacher and Fernholz (*E. S. R.*, 83, p. 14). The activities of the 2-ethyl-, and 2-*n*-propylnaphthoquinones and of the 2,8- or 2,6- or 2,7-dimethyl-1,4-naphthoquinones were found to be less than that of the 2-methyl naphthoquinone.

Alimentary K-avitaminosis in rats, H. DAM and J. GLAVIND (*Ztschr. Vitaminforsch.*, 9 (1939), No. 1–2, pp. 71–74; *Ger., Fr. abs.*, p. 74).—The production of K avitaminosis in rats by dietary means is reported. It is stated, however, that rats show no constant behavior in this regard, and that the symptoms may be very marked in some rats, while others remain unattacked even after a very considerable time. In this study K avitaminosis was produced within 15–80 days in 7 out of 15 rats by feeding them an artificial diet without vitamin K. Of the affected animals, only 3 showed hemorrhages, 2 dying from this cause. Seven of the animals not showing hemorrhages had normal coagulation, while 4 of them had a very marked reduction of their prothrombin. Intravenous injection of an emulsion of vitamin K concentrate, administered to 3 of the 4 rats which showed abnormal coagulation, effected a rapid cure of the disease.

TEXTILES AND CLOTHING

Problems in fur fiber research, T. M. PLITT (*Amer. Fur Breeder*, 13 (1940), No. 2, pp. 14, 15, figs. 4).—A brief discussion with illustrations of methods developed in the Bureau of Biological Survey, U. S. Department of the Interior, for studying the structure of individual hairs in the pelts of fur-bearing animals.

Type of fur fibers, T. M. PLITT and J. I. HARDY. (U. S. D. A. et al.). (*Amer. Fur Breeder*, 13 (1940), No. 2, p. 29).—A further discussion on the relation of fiber structure to fur quality, with a description of mounting technics for the microscopic study of fur fibers.

Technical evaluation of textile finishing treatments: Flexibility and drape as measurable properties of fabric, L. J. WINN and E. R. SCHWARZ (*Textile Res.*, 10 (1939), No. 1, pp. 5–16, figs. 6).—A technical and detailed presentation of a study noted essentially from another source (*E. S. R.*, 83, p. 860).

HOME MANAGEMENT AND EQUIPMENT

House planning ideas of Oregon rural women, M. WILSON and L. WELLS (*Oregon Sta. Bul.* 369 (1940), pp. 28, fig. 1).—On the basis of replies from Ore-

gon homemakers to a questionnaire covering opinions as to the desirability of various features of a dwelling, the preferences are summarized of farm and other homemakers in the State for the major features of the dwelling, together with descriptions of 16 house plans to meet the various preferences recorded. Of the 450 homemakers who cooperated in the study, 60 percent lived on farms and 40 percent lived in villages, suburban districts, and on acreages. The households of the farm homemakers averaged 4.1 persons and of the others 3.9. There were children under 19 yr. of age at home in 75 percent and of preschool age in 30 percent of the homes.

One-story and two-story houses were about equally favored considering the State as a whole, with slight differences in favor of two-story houses west of the Cascades and one story east of the Cascades. Four out of five women voted for a basement regardless of the number of stories preferred, but with various suggested uses. Living room dimensions satisfying the largest portion of the women were 15 by 20 ft. and bedrooms 12 by 14 ft. Dining rooms were desired by most of the women, but five out of six wanted kitchens large enough to serve family meals comfortably on occasion. Only one in eight favored a combination dining-living room. Out-of-door dining areas were popular both for family meals and for serving meals to crews of farm help. At least one bedroom on the first floor was specified by 99 percent of the women and a second one by many with young children. It is suggested that this should be planned as a multipurpose room. A fireplace in the living room was regarded as desirable, even when not needed as an extra source of heat, by more than 75 percent of the women. A large fabric rug for the living room was favored by more than one-third of the farm women and more than one-half of the others, with linoleum receiving almost one-third of the farm votes but very few of the others. For the dining room linoleum covering the entire floor or a large linoleum rug was favored by three-fourths of the farm women and three-fifths of the others.

Electric light for the farmstead (*U. S. Dept. Agr., Farmers' Bul. 1838 (1940), pp. 61, figs. 43*).—This publication presents information on good lighting practices to serve as a guide in planning installation of lighting fixtures and the necessary wiring. Detailed consideration is given to the essentials of good lighting, types of lighting, fixtures, portable lamps and bulbs; remodeling old lighting installations and equipment; yard lighting; lighting farm buildings with reference to natural and artificial lights and wiring; and planning of lighting for farm buildings, with recommendations based on observations and records as to adequate lighting for meeting the special needs in the various buildings.

The publication is well illustrated, and descriptive material is adequately supplemented by diagrams. In planning installation it is suggested that the activities to be carried on in each room be analyzed and grouped according to requirements for general or local lighting; that general lighting, with switch control if possible, be furnished for each room, hall, and stairway; that local lighting with wall brackets or portable lamps be provided for group activities, for working, and for reading and sewing (such provision being adjustable within given expenditure limits); that similar procedures be followed in planning for outdoor paths and farm buildings; that adequate sizes of light bulbs (as recommended) be used; and that wiring be of adequate size to carry the expected load.

A set of utensils for the farm kitchen, M. WILSON and H. E. McCULLOUGH (*Oregon Sta. Cir. 134 (1940), pp. 31, figs. 5*).—Among the sources of information used in preparing this list of minimum essentials in utensils (nonelectric) for western Oregon farm kitchens were laboratory tests, information from farm homemakers, and recommendations in the literature. Following a brief description

of the procedure used in the selection of articles for the list and a discussion of general considerations, sections are devoted to materials used in utensils, with their suitability for different purposes and advantages and disadvantages over other materials; storage of kitchen utensils, with considerations in planning and types of storage facilities; and points in buying and care of utensils for different purposes. The recommended set of utensils is tabulated by function, with points to be considered in selection, uses, and estimated frequency of use. As a definite buying guide a classified list of these utensils is given, with the cost at retail prices in Corvallis or Portland of the different groups included.

Study of kinds and maintenance of floor finishes best suited for household use (*Rhode Island Sta. Rpt.* [1939], pp. 47, 48).—This progress report (E. S. R., 81, p. 887) describes briefly the technic for evaluating film-forming wood finishes with an accelerated wear testing machine developed at the station.

Use of cold storage lockers rapidly expanding in Utah (*Farm and Home Sci. [Utah Sta.]*, (1940), No. 3, p. 12, fig. 1).—This article presents a very brief survey as to the distribution and capacity of the 31 plants in operation in Utah; the growth of the storage locker system in the State; the chilling, cutting and processing, sharp freezing, and freezer storage services rendered by individual plants; and the advantages and problems of freezer locker storage.

MISCELLANEOUS

Forty-ninth Annual Report [of Alabama Station], 1938, M. J. FUNCHES ET AL. (*Alabama Sta. Rpt.* 1938, pp. 29).—The experimental work reported is for the most part referred to elsewhere in this issue.

Fiftieth Annual Report [of Arizona Station], 1939, P. S. BURGESS ET AL. (*Arizona Sta. Rpt.* 1939, pp. 102, figs. 26).—This includes an account entitled Fifty Years of Achievement by the Arizona Agricultural Experiment Station (pp. 3-29), the pioneering years being discussed by R. H. Forbes, the middle years by J. J. Thornber, and the final decade by Burgess. The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-second Annual Report [of Georgia Station, 1940], H. P. STUCKEY (*Georgia Sta. Rpt.* 1940, pp. 93, figs. 15).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-second Annual Report [of Rhode Island Station, 1939], B. E. GILBERT (*Rhode Island Sta. Rpt.* [1939], pp. 61-[1]).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Mississippi Farm Research, [August 1940] (*Miss. Farm Res. [Mississippi Sta.]*, 3 (1940), No. 8, pp. 8, figs. 8).—In addition to articles noted elsewhere in this issue, this number contains Soil Conservation Not a New Problem, But of Increasing Acuteness, by C. Dorman (pp. 1, 8), and Federal Inspection Cream and Butter Requires Farm Care, by F. H. Herzer (pp. 1, 7).

Analytical index and list of publications of the Virginia Agricultural Experiment Station, 1888-1938, A. P. CUNNINGHAM, J. D. OBENSHAIN, and L. R. CAGLE (*Virginia Sta.*, 1938, pp. 118).

Public ownership versus State purchasing: The case of printing, E. E. SPARLIN. (Univ. Ark.). (*Jour. Polit. Econ.*, 48 (1940), No. 2, pp. 211-221).—Arguments are presented in favor of "a combination of the public plant and contract systems."

NOTES

Georgia University and Station.—F. W. Pelkert has resigned as associate professor of agricultural engineering of the university to accept a similar position in the Texas College and Station, and has been succeeded by J. L. Shepherd. Other appointments include Joseph W. Kelly as associate professor in poultry and James B. Cooper and D. T. Sullivan as instructors in poultry and horticulture, respectively.

The station observed the sixth annual Dahlia Field Day October 13, 1940, when over 2,000 visitors inspected the blooms of more than 100 new varieties of dahlias being tested for growth in Georgia. Roots for the test were contributed by 22 dahlia producers throughout the United States.

New Hampshire University and Station.—Dr. Ormond R. Butler, since 1912 professor of botany and botanist, died October 24, 1940, aged 63 years.

Dr. Butler was a native of Australia, coming to the United States in 1895 and receiving the diploma of the Institut Nationale Agricole of Lausanne, Switzerland, in the same year. Subsequently he received from the University of California the B. S. and M. S. degrees and from Cornell University the Ph. D. degree in 1910. Prior to coming to New Hampshire, he had been associated with the horticultural and botanical work of the Universities of California and Wisconsin.

In the words of a recent statement issued by the station, "In his chosen field Dr. Butler was one of the world authorities on copper compounds in relation to control of fungus diseases. His published papers on copper fungicides are widely known throughout the world and are classics. Because of the relation of copper sprays to certain plant diseases, Dr. Butler gave special attention to the control of apple diseases and the relation of control measures to the production of fruit and to the control of potato diseases. He was the moving spirit in building up the growing of seed potatoes in New Hampshire and in the present advanced practice of potato seed certification."

Cornell University and Station.—Dr. Benjamin D. Wilson, associated with the agronomic work of the College of Agriculture since 1917 and professor of soil technology and soil chemist since 1934, died September 5, 1940, following an automobile accident in Ohio. He was a native of Kentucky, receiving the B. S. and M. S. degrees from the University of Kentucky in 1909 and 1914 and the Ph. D. degree from Cornell in 1917. He was assistant chemist in the Kentucky Station from 1909 to 1914.

Drs. Gordon H. Ellis and Karl C. Hamner have been added to the faculty of the College of Agriculture and the Federal Regional Soil and Nutrition Laboratory, the former as biochemist in the laboratory and assistant professor of biochemistry and nutrition and the latter in charge of plant investigations in the laboratory and assistant professor of plant physiology.

New York State Station.—Fred E. Gladwin, chief of research (pomology) since 1936, died November 16, 1940, at the age of 63 years. A native of New York and a graduate of the University of Rochester in 1904, he was appointed a special agent of the station in 1909 and placed in charge of the newly established Vineyard Laboratory at Fredonia. His subsequent service was with this laboratory, and he became exceptionally well-informed on all matters pertaining to grape growing.

Ralph R. Jenkins, associated with the chemical research of the station since 1930 (since 1936 on the quick freezing of fruits and vegetables), died October 9, 1940, in his thirty-eighth year. He was a native of Massachusetts and had received the B. S. and M. S. degrees from the University of New Hampshire.

The recent death is also noted of Dr. Edward C. Worden, assistant chemist in 1896-97 and subsequently in chemical work in New Jersey.

Dr. W. I. Zimmerman has been appointed assistant in research (chemistry) vice Ralph Colmer, resigned.

Vermont University.—Dr. Guy W. Bailey, comptroller since 1917, acting president in 1919, and president since 1920, died October 22, 1940, at the age of 64 years. He was a native of Vermont, graduating from the university in 1900, and receiving the LL. D. degree from the university, Middlebury College, and Norwich University, and was associated with many Vermont undertakings. A recent statement in *School and Society* notes that "his administration of the university was marked by the most extensive building program in its history, as well as by substantial increases in enrollment and the provision of new scholarship and endowment funds."

U. S. D. A. Library.—On November 15, 1940, Claribel R. Barnett and Emma B. Hawks, librarian and assistant librarian, respectively, retired, terminating a service beginning in 1895 and which in the words of an appreciative memorandum by Secretary of Agriculture Claude R. Wickard has been "responsible for the leadership and development of what is today truly one of the world's great libraries in the field of agriculture." Ralph R. Shaw, chief librarian of the Gary (Ind.) Public Library, has been appointed librarian, and Mary G. Lacy, librarian of the Bureau of Agricultural Economics, assistant librarian.

The librarian has been given general supervision and coordination of library work in the Department. A library advisory committee has also been established, consisting of the Director of Research as chairman, the Director of Extension Work, the Director of Information, and the Chief of the Bureau of Agricultural Economics, together with a rotating membership of the Chiefs of three bureaus to be designated by the chairman of the committee.

Association of Official Agricultural Chemists.—This association held its fifty-sixth annual meeting in Washington, D. C., from October 28 to 30, 1940, with a registration of over 500. The address of the president, Dr. W. W. Skinner, dealt mainly with the history and development of the association and called attention to its broadening field and dependence on new methods in which physical and biological measurements play an increasing part. Officers for the ensuing year were elected as follows: President, L. B. Broughton; vice president, J. W. Sale; secretary-treasurer, W. W. Skinner; and as an additional member of the executive committee, G. H. Marsh.

Association of American Feed Control Officials, Incorporated.—The thirty-second annual convention of this association was held in Washington, D. C., on October 31 and November 1, 1940, with representatives of 30 States and several agencies of the Federal Government in attendance. The address of the president, J. F. King, discussed ways of improving the work of the association and the promotion of greater uniformity in reporting results by the various States. Among the special papers was one by R. M. Bethke of the Ohio Experiment Station entitled Protein, Fat, and Fibre. Officers for the ensuing year were elected as follows: President, J. B. Smith; vice president, P. B. Curtis; secretary-treasurer, L. E. Bopst, College Park, Md; and additional member of the executive committee, H. H. Hanson.

Association of Land-Grant Colleges and Universities.—In addition to the general officers enumerated on page 5, the following section officers were elected

at the Chicago meeting of November 11-13, 1940: Agriculture, T. R. Bryant of Kentucky, chairman, A. L. Deering of Maine, vice chairman, and L. E. Call of Kansas, secretary; engineering, H. B. Dirks of Michigan, chairman, and B. R. Van Leer of North Carolina, secretary; home economics, Margaret S. Fedde of Nebraska, chairman, and Florence Harrison of Missouri, secretary; and graduate work, C. W. Hungerford of Idaho, chairman, and W. C. Russell of New Jersey, secretary. Within the section of agriculture, the subsection of experiment station work elected M. F. Miller of Missouri, chairman, and C. R. Orton of West Virginia, secretary; the subsection of resident teaching, E. L. Anthony of Michigan, chairman, and H. H. Hume of Florida, secretary; and the subsection of extension work, J. E. Carrigan of Vermont, chairman, and P. E. Miller of Minnesota, secretary.

The committee on experiment station organization and policy was reorganized and enlarged to provide representation for the four quarters of the Nation. The new members added for agriculture are J. A. Hill of Wyoming and M. J. Funchess of Alabama, while for home economics Esther L. Batchelder of Rhode Island, Margaret S. Fedde of Nebraska, Agnes F. Morgan of California, and Statie E. Erikson of Kentucky (reappointment) were named for terms of 4, 3, 2, and 1 year, respectively, and Sybil L. Smith and Louise Stanley of the U. S. Department of Agriculture were given the status of members *ex officio*.

Other committee changes included the appointment of C. S. Boucher of Nebraska and J. A. Burruss of Virginia to the committee on college organization and policy, vice F. D. Farrell of Kansas and H. C. Byrd of Maryland. On the committee on instruction in agriculture, L. E. Jackson of South Dakota and P. W. Chapman of Georgia, succeeded H. H. Kildoe of Iowa and V. C. Freeman of Indiana, and on that on instruction in engineering, Gibb Gilchrist of Texas succeeded P. H. Hammond of Pennsylvania. Pearl S. Greene of Maine and Florence Harrison of Missouri were succeeded on the committee on instruction in home economics by Mildred T. Tate of Virginia and Laura W. Drummond of Pennsylvania; J. C. Taylor of Montana, C. E. Brehm of Tennessee, and Venia M. Kellar of Maryland on extension organization and policy, by William Peterson of Utah, E. E. Scholl of Oklahoma, and Marion Butters of New Jersey; G. D. Humphrey of Mississippi and A. C. Willard of Illinois on military organization and policy by J. W. Fulbright of Arkansas and F. L. Eversull of North Dakota; and E. B. Norris of Virginia on engineering experiment stations by H. P. Hammond of Pennsylvania. In the special committees, H. J. C. Umberger of Kansas was succeeded on the radio committee by J. F. Cunningham of Ohio; L. N. Duncan of Alabama on land-grant institutions for Negroes by R. F. Poole of South Carolina; C. A. Lory of Colorado, C. E. Friley of Iowa, and C. W. Creel of Nevada on relationships by J. R. Hutcheson of Virginia, R. E. Buchanan of Iowa, and L. R. Simons of New York; R. G. Bressler of Rhode Island on rural youth by E. H. White of Mississippi; and C. A. Lory of Colorado on preservation of phosphate deposits by R. M. Green of Colorado. On the joint committee on projects and correlation of research Noble Clark of Wisconsin succeeded V. R. Gardner of Michigan, and on that on publication of research, C. B. Hutchison of California replaced C. E. Ladd of New York. No change was made in the committee on training for Government service or the joint committee on accrediting, and the committee on the engineering experiment station bill was discontinued. H. L. Bevis of Ohio became a representative to the American Council of Education, vice J. J. Tigert of Florida.

EXPERIMENT STATION RECORD

VOL. 84.

FEBRUARY 1941

No. 2

RESEARCH AT THE 1940 CONVENTION OF THE ASSOCIATION OF LAND-GRANT COLLEGES AND UNIVERSITIES

In an organization as complex as the Association of Land-Grant Colleges and Universities, the emphasis given to a specific interest is bound to fluctuate more or less from year to year. There is therefore no special significance to be attached to the statement that the 1940 convention was not outstanding in its relations to research. In the three general sessions, there was one address from this standpoint, that by Dr. L. W. Wallace, director of engineering and research for the Crane Company, on The Human Factor in Industrial Research. The joint session of the three subsections of agriculture was given up entirely to other matters, and this was largely true of the programs of the sections of engineering, graduate work, and home economics. On the other hand, there was a joint session of the subsections of resident teaching and experiment stations on the topic The Protection of College and Station Workers From Too Many Outside Demands, and there was of course the usual extensive consideration in the experiment station subsection, which had two convention sessions and a day of preconvention meetings. Attention was also accorded research aspects in the panel discussion of the subsection of resident teaching, led by Mr. R. W. Trullinger, Assistant Chief of the Office of Experiment Stations, and entitled Training for Public Service in the Field of Agriculture, and the reports at a luncheon of the home economics section on current research at the land-grant colleges by Miss Sybil L. Smith of the Office of Experiment Stations and at the Bureau of Home Economics by Dr. Louise Stanley, Chief of that Bureau. Reference has already been made in the account of the convention in the January issue (E. S. R., 81, p. 1) to the emphasis laid on research developments in home economics by Miss Lita Bane in the general sessions and by the section of home economics in its discussion of National Nutrition in the Defense Program.

The address of Dr. Wallace maintained that although research is being handicapped by its perversion abroad to destructive purposes, it is still indispensable to progress. His discussion was largely from the standpoint of industry, in which field the isolated effort of individuals is becoming increasingly less important than group organization

and cooperation. He criticized the tendency in educational institutions when preparing research workers to devote too much time to technical processes at the expense of developing fundamental principles and analytical judgment, and urged that all possible encouragement be given to students with intellectual honesty, an exploring urge, and tenacity of purpose.

Another paper of general application, although confined in its treatment to the State experiment stations, was that of Director F. J. Sievers of Massachusetts on Some Essentials and Nonessentials in Agricultural Research. Prominent among the qualifications for a research staff was placed the need of a vivid imagination expressed in such ways as "a keen sense of humor, a flexibility in mental make-up readily adaptable to new and changing conditions, a power of discrimination between the important and unimportant, and a knowledge of research limitations as regards personal, technical, and laboratory equipment." Another essential enumerated was personal courage, which he felt to be even more important today than ever before. There is, he maintained, "more demand today for intelligent and unbiased opinion than there is for the fundamental research upon which such opinions should be based. If our experiment stations, as public services, are to contribute to the solution of the several prominent sociological and economic problems confronting this country, our people must develop and express the courage to assume some leadership in putting plans into operation." He also argued for the development on the part of directors of a sympathetic as well as an informed leadership, since "the answer to problems involving human relationships needs to depend upon more than mere scientific soundness."

The discussion of the protection of workers from undue outside demands was developed as to the instruction staff by Director L. E. Call of Kansas and as to the station personnel by Assistant Director Noble Clark of Wisconsin. Both speakers conceded the desirability of some outside activities, and Director Clark stressed particularly the need for such contacts in the case of research people active in an applied field like agriculture. He saw in the increasing demands an implied vote of confidence in research and an indication that it is "winning its place in the sun of public confidence." Nevertheless he felt that dissipation of funds and time should be avoided, since research is "as socially necessary as competing activities." "I believe," he said, "that the citizens of the United States owe much more of their present security, comfort, and convenience to the results obtained by research workers in our agricultural experiment stations and universities than to the achievements of any similar number of citizens or any organization, public or private, which has received comparable financial support. Having station workers drop their research to take on other

kinds of assignments is, therefore, mighty hard to justify as in the public interest." Particularly he deprecated the impairment of energies by undue demands for committee service and administrative duties, as well as for too much teaching, close supervision of graduate students, or excessive extension or action appeals. On the other hand he advocated a larger share by station workers in the planning of programs in which they will eventually participate.

Coordinated Regional Research on Marketing Problems was discussed by Director E. C. Johnson of Washington. He pointed out that for such commodities as apples "the great magnitude of the marketing problems in terms of geography and their similarity for contiguous areas of commercial production are the principal reasons why the possibilities of coordinated regional marketing research should be carefully considered." In his opinion, "the need for cooperative research will be determined largely by the similarity of the marketing processes for one or more products produced in adjacent States or by the similarity of one or more marketing services for the products of two or more States." Although cooperative research has its limitations, previous experience indicates that under appropriate conditions it yields results which are better than those possible for any one agency operating independently.

Another practical problem was analyzed very thoroughly by Director H. J. Reed of Indiana. This was the economy and feasibility of carrying on research on land not owned by the stations. Director Reed pointed out that some land must inevitably be owned, especially that in locations where permanence is essential and there are substantial investments in buildings. Nevertheless ownership involves substantial initial expense, removes property from the tax rolls, provides only a single area which may not always be widely representative, and ties up capital in holdings which may be expensive to maintain and difficult to dispose of if their usefulness becomes impaired. Under certain conditions, therefore, he saw definite advantages in other forms of tenure.

The familiar subject of experiment station publications and mailing lists was assigned to Director Fred Griffie of Maine and discussed by him on the basis of a questionnaire from which 51 replies were available. Perhaps the most striking finding was that of the diversity of practice. No fewer than 23 types of publications were reported, and in some stations as high as 6 separate series. Bulletins are issued by all stations, but they vary widely as to scope and treatment. Four stations now maintain a "research" bulletin series, 13 a "technical," and 1 a "memoir" series; 27 print and 13 mimeograph circulars; 20 still include research findings in annual reports; and 8 are issuing periodicals. Similar diversity prevails as to size of edition and plan

of distribution, although the method of issuing announcements and sending publications upon request is steadily increasing. Director Griffie argued for more standardization in series and the provision of a reasonably large and accessible edition, since the cost of publication is but a fraction of the total expenditure on a research project.

The customary reports of committees were presented to the experiment station subsection, although that of the committee on experiment station organization and policy was made and discussed in part in a preconvention session and to that extent was not available to the general public. The committee itself was enlarged to insure full regional representation in both agriculture and home economics.

The report of the committee on projects and correlation of research as submitted by its chairman, Director S. B. Doten of Nevada, called attention to the possibilities of increasing informal cooperation among research workers. The relationship of the experiment stations to land-use planning was regarded as still incompletely defined, but the committee reported that "it is recognized that insofar as it is practicable, the assembling, with the help of all subject-matter divisions, of needed information on specific problem areas or on problems coming within a land-use planning unit is a function and responsibility of the experiment stations." The appointment of a special committee of station directors to work with the Office of Experiment Stations in more completely formulating station policy in correlating their activities with the land-use planning movement was recommended. A supplementary statement on the current status of cooperative research undertakings indicated that in 1940 "State extension, research, and special planning agencies in every State were participating in this movement, which had reached a stage of organization where the research needs of the land-planning programs were becoming apparent in terms of specific problems for study."

The report of the joint committee on publication of research was given by Director S. W. Fletcher of Pennsylvania. During the year ended October 31, 1940, the number of manuscripts received for publication in the *Journal of Agricultural Research* totaled 133, of which 73 were from the Federal Department of Agriculture, 59 from the stations, and 1 cooperative.

In addition to the items scheduled on the program, a number of other matters received consideration by the section. One of these was the relation of research to the defense requirements of the Nation along nutritional lines. This topic was discussed by Dr. M. L. Wilson, U. S. D. A. Director of Extension, who pointed out the need from this standpoint of additional nutritional inventories of families and special groups and of studies on the causes underlying food habits and the decline in many areas of food production on farms.

Another matter, presented in connection with the report of the committee on experiment station organization and policy, was that of inter-American relationships. The work of the Federal committee on cooperation in agricultural education (*E. S. R.*, 83, p. 289) was summarized by its chairman, Assistant Dean Knowles Ryerson of California, with special mention of such phases as exchange professorships and fellowships, the accrediting of institutions, the development of courses, and the preparation of publications in Spanish and Portuguese, and the status of the proposed Tropical Research Institute and the American Society of Agricultural Sciences. The field and outlook of this society was further discussed by Director J. A. B. Nolla of the Puerto Rico University Experiment Station and others, and announcement was made of special rates to members of affiliated societies.

Thus the convention had before it a wide range of questions more or less directly related to research, and also what is perhaps of even greater importance, a reasonable amount of time available for their consideration. It afforded an excellent opportunity for enlightenment on current issues and for a clarification of views and policies. Its specific reaction toward research matters was both constructive and stimulating.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

Chemistry forms background for most agricultural research (*Farm Res. [New York State Sta.]*, 6 (1940), No. 4, pp. 4, 6).—The essential service of the chemistry division to the work of other divisions of the station and the direct service of chemical research in the solution of agricultural problems are pointed out, and both fields of the chemical work are briefly discussed, with illustrative instances.

Biochemistry and agrostological problems, A. G. NORMAN. (*Iowa State Col.*). (*Chron. Bot.*, 6 (1940), No. 2, p. 30).—A review of recent advances.

[Chemical investigations by the Indiana Station]. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt. 1939*, pp. 9, 10, 12, 24-29, 30, 31, figs. 3).—This report notes briefly numerous results of soybean constituents research; factors affecting the canning quality of pumpkins; and seasonal changes occurring in composition of various parts of Winesap apple tree, together with work on a chemical study of quality of inbred lines of sweet corn, by D. M. Doty and J. R. Roach; the photoelectric spectrophotometer, carotenoid pigments, and micro melting point apparatus, all by F. P. Zscheile and J. W. White; photoelectric photometer, by Zscheile, C. L. Shrewsbury, and H. R. Kraybill; chlorophyll pigments and photosynthesis, by Zscheile, C. L. Comar, and L. F. Green; determination of carotene added to butterfat, by Shrewsbury, Kraybill, and Zscheile; separation of glycerides of soybean oil, by A. W. Kleinsmith, Kraybill, and M. H. Thornton; preparation of sterols from soybean oil, by Kraybill, Thornton, and K. E. Eldridge; nonfat constituents of soybean oil, by Thornton and Kraybill; carbohydrates of the soybean, by E. D. Walter; and variation in composition of different fractions of peppermint oil obtained during the distillation, by L. J. Swift.

The quantitative chemical determination of carotenoids and vitamin A in serum [trans. title], H. WILLSTÄDT and T. K. WITZ (*Ztschr. Vitaminforsch.*, 9 (1939), No. 3, pp. 212-223; *Fr., Eng. abs.*, pp. 222, 223).—The different methods for determination of serum carotenoids and vitamin A are discussed, and a slightly modified method applicable to hemolyzed or nonhemolyzed samples is presented. The alkali-treated serum is extracted with alcohol and finally with ether, and the residue from the ether extract is taken up in benzene and used for the determinations. The vitamin A is determined by the Carr-Price reaction, and the blue values for this as well as the yellow values for the carotenoids are determined by the step photometer and referred to standard calibration curves. Upon all the sera adsorption analysis of the carotenoids is performed, this being of help in determining the correction factor for the carotenoids in the Carr-Price reaction. Protocols are presented showing for the 15 cases studied a total carotenoid content varying from 0.7 to 145.7 per 100 cc.; corrected values for vitamin A ($E_{61/E_{43}}=0.15$) varied in 6 cases from 66 to 743 International Units per 100 cc. Lycopene was not found in any of the sera tested.

A method for determining ascorbic acid [trans. title], I. ROSENTHALFR (*Ztschr. Vitaminforsch.*, 9 (1939), No. 4, pp. 342-344; *Fr. Eng. abs.*, p. 344). The method as described (in detail) is applied to a dilute (0.1 N) hydrochloric acid solution of pure ascorbic acid. It involves the reduction of mercuric to mercurous chloride, with iodometric determination of the latter compound.

Riboflavin content of yeasts determined photometrically and biologically, A. E. SCHUMACHER and G. F. HEUSER. (Cornell Univ.). (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 4, pp. 203, 204).—By the photometric method described, the riboflavin is determined in a 5 percent hydrochloric acid extract of yeast; the extract is adjusted to pH 3.5-4.0 to give a clear solution, reduced with sodium hydrosulfite to destroy irreversibly reducible interfering pigments, and finally shaken with air to reoxidize the riboflavin. The clear filtrate thus prepared is used for the photometric determination of riboflavin, the photometer used and the method followed being the same as those described by Sullivan and Norris (*E. S. R.*, 83, p. 152). The formula used for the calculation to micrograms of riboflavin per gram is presented.

The chick and hen bio-assays used involved feeding of the test yeast to birds on a basal diet low in riboflavin but otherwise complete, and comparing the response with that obtained in positive control groups receiving graded amounts of a previously standardized dry skim milk. The data presented show that there is good agreement of results of riboflavin determinations by the photometric method, that these results agree well with chick and hen bio-assays, and that the different samples of yeasts vary widely in their riboflavin content; various primary yeasts, for example, contained from 34.2 to 78.2 μ g. per gram.

Values obtained by the above procedures were not, however, in good agreement with rat assay values (reported from the laboratory supplying the yeasts) determined by the regular Bourquin-Sherman procedure for vitamin G. No single conversion factor could be employed to convert Bourquin-Sherman units to micrograms of riboflavin, although in general residual yeasts gave a conversion factor of approximately 2.0 μ g of riboflavin per Bourquin-Sherman unit, while primary grown yeasts gave a conversion factor of approximately 1.3 μ g.

The colorimetric microdetermination of copper [trans. title], I. NUMATA and D. MATSUKAWA (*Jour. Biochem.*, 30 (1939), No. 3, pp. 395-399).—Details as to reagents and the various steps in the determination are presented for this method, employing the dithizone reaction and the Pulfrich photometer for color comparison.

Methods for estimating the iron and copper content of butter, G. M. MOIR and E. D. ANDREWS (*New Zeal. Jour. Sci. and Technol.*, 21 (1940), No. 5A, pp. 249A-265A).—New technics, termed filtration methods, for the extraction and colorimetric estimation of iron and copper in butter are described. A modification of the conventional wet-ashing method for determining copper in butter also is outlined. Good checks were obtained for iron and copper values determined by the different methods. The principal advantages claimed for the filtration method are simplicity of manipulation with a minimum possibility for contamination of the sample.

The neutralisation value of ghee (butter-fat), H. HAWLEY (*Curr. Sci. [India]*, 9 (1940), No. 7, pp. 337-339).—Determination of the neutralization value of butterfat by the described method readily permitted the detection of adulteration by animal fat and also the detection of adulteration with vegetable fats without resort to a sterol acetate test. Typical values for pure butterfat and various adulterated fats are presented.

Exclusion of lead from maple products (*Vermont Sta. Bul.* 463 (1940), pp. 18, 19).—This report notes further studies (E. S. R., 80, p. 153).

The relation between quality and chemical composition of canned sauerkraut, C. S. PEDERSON (*New York State Sta. Bul.* 693 (1940), pp. 15, figs. 11).—The author examined for quality as compared with chemical composition 332 samples of commercial canned sauerkraut obtained from packers throughout the country.

In general, the samples of poorer quality sauerkraut showed some abnormality in chemical composition, many of them containing less than the required 1 percent of acid, or more than 2.5 percent or less than 1.5 percent salt. The better samples of sauerkraut showed a higher average vitamin C content and more constant amounts of acids, salt, and alcohol. The samples of sauerkraut showing high or low percentages of salt were more often soft, while those containing between 1.5 and 2.5 percent were of firm texture.

Comparisons of determinations of the salt content as obtained by titration and by salometer readings showed that the salometer is not suitable for measuring the salt content of sauerkraut.

The making of candied fruits a practical home industry, F. A. LEE (*Farm Res. [New York State Sta.]*, 6 (1940), No. 4, p. 7, figs. 2).—The candying process, it is noted, involves the gradual building up of the sugar concentration of the fruit by daily additions of sugar to the sirup in which the fruit is immersed. To give a glazed surface when the fruit is dried (after about a week in the sirup) about one-eighth (or more) of the sugar used is supplied as corn sirup. Fruits for candying are picked firm ripe. Napoleon or Bing varieties for cherries, Reine Claude, Coulon, and Italian Prune for plums and Elberta peaches are suggested as firm varieties that give satisfactory results.

Adequate cleaning methods in food plants costly but essential, W. G. WALTER and G. J. HUCKER (*Farm Res. [New York State Sta.]*, 6 (1940), No. 4, pp. 1, 12, fig. 1).—This is a more or less popular discussion of various methods of cleaning and sterilizing equipment and containers used in handling and packaging. It is pointed out that adequate cleaning and sterilizing methods are necessary to the farmer who sells food products at a roadside stand as well as to the large-scale packer or bottler.

AGRICULTURAL METEOROLOGY

An automatic weather station, H. DIAMOND and W. S. HINMAN, JR. (*Jour. Res. Natl. Bur. Standards [U. S.]*, 25 (1940), No. 2, pp. 133-148, pls. 8, figs. 6).—An important contribution of radio to the collection of weather data lies in the possibility of utilizing completely automatic stations at isolated locations, whereby information on the meteorological factors of interest is automatically transmitted at predetermined intervals. The authors detail a method for the remote indication by radio of measurements of barometric pressure, air temperature, relative humidity, wind direction and velocity, rainfall, and other meteorological factors. This method retains the operating principles of the audio-modulation type radiosonde, but, because of the use of much lower audio frequencies, affords important simplifications in the transmitting and receiving equipment. An experimental installation is described, and measurements for a 30-day period are analyzed.

An improved radio sonde and its performance, H. DIAMOND, W. S. HINMAN, JR., F. W. DUNMORE, and E. G. LAPHAM (*Jour. Res. Natl. Bur. Standards [U. S.]*, 25 (1940), No. 3, pp. 327-367, pls. 4, figs. 30).—This describes improvements in component elements of the radiosonde system noted above and discusses per-

formance. The major improvement is in measuring relative humidity. The modified apparatus is shown capable of measuring barometric pressure to an accuracy of 5 mb., temperature to 0.75° C., and relative humidity to 5 percent.

Monthly Weather Review [May-June 1940] (*U. S. Mo. Weather Rev.*, 68 (1940), Nos. 5, pp. 125-156, pls. 12, figs. 6; 6, pp. 157-180, pls. 12, figs. 13).—In addition to the usual detailed summaries of meteorological and climatological data, including observations on aerology, weather on the Atlantic and Pacific Oceans, and rivers and floods; solar radiation and sunspot data; and other information, these numbers contain the following articles:

No. 5.—Sounding-Balloon Observations at Omaha, Nebr., During the International Months July 1938 and April 1939, by L. F. Hafer (pp. 125-129); and The First Century of Meteorological Data in America, by R. H. Brown (pp. 130-133).

No. 6.—An 80-Year Temperature Record [at Marengo, Ill.], by C. J. Root (pp. 157, 158); and Relation of Recent Glacier Recessions to Prevailing Temperatures, by J. B. Kincer (pp. 158-160).

The air and its mysteries, C. M. BOTLEY (*London: G. Bell & Sons, 1938, pp. XV+296, pls. [17], figs. 23*).—This semipopular book deals descriptively with meteorology, recording the methods and results of observation and experiment by which the knowledge of the subject has been advanced and principles established for practical service and intellectual expansion. A foreword is by R. A. Gregory.

Synoptic conditions accompanying tornadoes in the United States during 1884, S. S. GAIGEBOV (*Amer. Met. Soc. Bul.*, 21 (1940), No. 6, pp. 229-236).—The conclusions drawn from this study are that the overwhelming majority of tornadoes originate in maritime tropical air, most of them are observed in the warm sector of the cyclones, and over half of them are at a distance of ± 250 -350 km. before the cold front. About 5 percent also occur before the warm front, and they appear most frequently to occur above the frontal surfaces and within the tropical air mass. Tornadoes are apparently not observed outside the region of the cyclone, and their tracks most frequently trail the isobars, occasionally deviating to the right. The tornado tracks are most frequently parallel to the cyclone-center tracks. In the maritime tropical air, in the vicinity of its source region the tornadoes are usually far removed from the fronts in the warm sectors of the cyclones over the midsouthern and southeastern United States. In the places where the tropical air has least relative humidity, the tornadoes arise near the fronts or immediately on them. A translation of the regions of tornado activity northward in summer and southward in winter takes place with the seasonal shifts on the polar-front zone.

Researches on temperature changes from day to day and solar constant variations, H. ARCTOWSKI (*Amer. Met. Soc. Bul.*, 21 (1940), No. 6, pp. 257-261, figs. 7).—A review and general discussion.

A comparison of upper soil temperatures and shelter temperatures, W. C. JACOBS. (U. S. D. A.). (*Amer. Met. Soc. Bul.*, 21 (1940), No. 5, pp. 181-183, fig. 1).—A minimum thermometer and soil thermograph were set up at the El Centro, Calif., fruit-frost temperature survey station for the purpose of comparing the upper soil temperatures with those measured at the same time in a standard fruit-region shelter with thermometer about 5 ft. from the ground. Preliminary results indicated that the minimum soil temperature at ± 3 -mm. depth averaged slightly higher than the shelter minimum but varied considerably with clouds and wind, and that the soil maximum departed widely from the shelter maximum but the departures were highly irregular.

Evaporation-loss per month from two drainage areas, D. LLOYD (*Roy. Met. Soc. [London], Quart. Jour.*, 66 (1940), No. 285, pp. 181-193, figs. 2).—"Monthly data of the apparent loss by evaporation, etc., of moisture from Vyrnwy and Rivington drainage areas are examined in relation to the rainfall and the temperature. After discussing the subject matter, the association and the degree of association are determined on the hypothesis that variations in evaporation loss can be associated with the variations in rainfall and temperature in a joint functional manner. The regressions have been computed together with the formal evaluation of the significance of the statistics. The results show that, when the temperature is constant, the evaporation loss is proportional to the rainfall; when the rainfall has a given value, the loss increases in relation to the temperature; while the loss is reduced according to the previous rainfall. There is similarity in the relations at Vyrnwy and Rivington."

Hydrologic studies: Compilation of rainfall and run-off from the watersheds of the Texas Agricultural Experiment Station, Substation No. 7, Spur, Texas, 1928-38, B. C. LANGLEY and D. L. BOWELL (*Coop. Tex. Expt. Sta.*). (*U. S. Dept. Agr., Soil Conserv. Serv., 1940. SCS-TP-35, pp. [239], figs. [129]*).

Indirect flood damages, L. O. BERCAW (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. List 13* (1940), pp. 16).—An annotated list of 41 references.

Normals for the climate of Montevideo, 1883-1938 [trans. title], L. MORANDI (*Rev. Facult. Agron. [Montevideo], No. 20* (1940), pp. 9-22, fig. 1).—Data are included on temperature, atmospheric pressure, humidity, rainfall, evaporation, cloudiness, wind, hail, and electrical manifestations.

White settlers in the Tropics, A. G. PRICE (*Amer. Geog. Soc. Spec. Pub. 23* (1939), pp. XIII+311, pls. 20, figs. 31).—As stated by H. S. Hotchkiss in the foreword, "While others have dealt with particular aspects of the problem and with specific regions, no one before, I think, has attempted as comprehensive a synthesis as has Dr. Price. . . . The book . . . derives its outstanding value from the author's broad outlook," covering as it does the historical, economic, social, administrative, medical, climatic, geological, and geographical phases of the general subject. Part 1 considers the nature and history of the problem of white settlement in the Tropics. Part 2 presents regional studies of white settlements in the trade-wind margins (Queensland and Florida), trade-wind islands of the West Indies, arid and wet-dry tropics in Australia, tropical plateaus (Costa Rica, South America, and Africa), and Americans in Panama. Part 3 takes up some factors governing white settlement in the Tropics, including racial problems, some environal factors, acclimatization and health (climatological, statistical, pathological, psychological, and physiological studies), diet and exercise, and administrative and economic problems. Appendixes by R. G. Stone consider some results of modern physiological research in relation to acclimatization in the Tropics, comfort zones and acclimatization, a note on cooling power, and additional references on physiology and acclimatization in the Tropics. A section (pp. 241-271) is devoted to notes and literature references on the 18 individual chapters, and an author-subject index is provided.

SOILS—FERTILIZERS

[Soil and fertilizer investigations by the Indiana Station] (*Indiana Sta. Rpt. 1939, pp. 48, 64*).—Work on diagnosing plant-nutrient deficiencies by means of plant-tissue tests, by G. D. Scarseth, and the influence of fertilizers on micro-organisms responsible for the fixation of nitrogen, by J. L. Roberts, is briefly noted.

A rapid-action soil tube jack, R. B. ALLYN. (U. S. D. A. and Oreg. Expt Sta.). (*Soil Sci.*, 50 (1940), No. 1, pp. 49-51, fig. 1).—This jack has a fulcrum block sliding on an upright of $\frac{3}{4}$ in. cold-rolled steel shafting set in a steel base plate, the fulcrum block being made to grip the upright at any point by lightly squeezing together a 9- by $\frac{1}{2}$ -in. control lever and the upright, thereby tipping the $\frac{11}{8}$ -in. opening through the block against the $\frac{3}{4}$ -in. vertical shaft which passes through it. A fully dimensioned working drawing accompanies the description.

Determination of soil structure by microscopical investigation, G. C. RIEDLICH (*Soil Sci.*, 50 (1940), No. 1, pp. 3-13, pl. 1, figs. 3).—The author describes a modification of the Kubišna section method (E. S. R., 80, p. 157) for the microscopic study of soil structure, a special soil tube being used for the sampling, and presents also a numerical expression of the relation between microscopically observable pore space and solid material. The use of the expression

$$\frac{\text{percentage of pore space} \times 100}{\text{percentage of crumbs larger than } 1,600\mu}$$

as a "soil quotient" is proposed. It is noted, however, that "the choice of the denominator is arbitrary, as evidence regarding the optimal crumb size for plant growth is not yet available." Microscopic observation was carried out by means of a polarizing microscope with the use of a 6 \times eyepiece fitted with a micrometer scale and a "No. 3" objective of N. A. 0.25 [the No. 3 objective of the maker named by the author is a 16-mm. achromatic, 10 \times]. In the polarized light and as seen through a gypsum plate, clay appears dark, crystals show interference colors, and the pore spaces, which are filled with the resinous material used in the Kubišna preparation method, appear violet. Clay and sand can therefore be readily distinguished from pores. Photographs taken at a still lower magnification (about 5 \times) accompany the paper.

Lysimeter studies.—IV, Movement of anions through the profile of a Gray-Brown Podzolic soil, J. S. JORRE. (N. J. Expt. Stas.). (*Soil Sci.*, 50 (1940), No. 1, pp. 57-63, fig. 1).—This paper presents summary data on the composition of the anions of leachings collected during 7 yr. from lysimeters of the funnel type (E. S. R., 69, p. 635). The author points out that of the data presented only those on the A horizon can be considered to be quantitative, since the movement of the water through the A horizon is vertical but through the B only partly so. "The rate of movement of water varies with the soil horizon, being faster through the A horizon because of the lighter texture and the more open structure. The heavier texture and more compact constitution of the B horizon will therefore cause water to accumulate at the junction of the A and B horizons. Under such circumstances the water begins to move horizontally along the B horizon, through which only a portion of it filters, most of it dropping through by way of channels," such as cracks produced by the drying out of the soil, root paths, and passageways and borings of earthworms, rodents, and other animals.

The results indicate that not much nitrogen is lost by leaching from the soil body under forest cover. Although data concerning cultivated soils obtained by means of funnel-type lysimeters are lacking, the author considers that more undoubtedly is lost from such soils than from forest soils. Of sulfur, the data indicate that relatively small quantities, as compared with those of other anionic elements, are leached out. Little or no loss of phosphorus was found. In forest soils "the roots pick up enough to satisfy the needs of the flora, and the dead organic matter returns a similar quantity of phosphorus." The movement of chlorine and silicon compounds through the A and B horizons was also measured.

The laws of soil colloidal behavior.—XXII, The thermal stability of acidoids and basoids, A. HOVDEN, L. WIKLANDER, and S. MATTSO (N. J. Expt. Stas.). (*Soil Sci.*, 50 (1940), No. 1, pp. 65-76, figs. 12).—A further study of this series (E. S. R.,

83, p. 23) indicates that thermal stability of soil acidoids and basoids seems to place them in the following order: Free humus acidoids < sesquioxide-bound humus acidoids < sesquioxide-basoids < silicic acidoids. As a result of destruction of the humus acidoids by heating for 6 hr. to 275° C., the exchange reactions of the soil become an expression of the mineral acidoid:basoid activity ratio and serve to characterize the soil type.

[Soil Survey Reports, 1932, 1933, and 1934 Series] (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpts.], Ser. 1932, No. 40, pp. 53, pl. 1, figs. 2, map 1; 1933, Nos. 33, pp. 29, pls. 2, figs. 2, map 1; 34, pp. 41, figs. 2, map 1; 1934, Nos. 21, pp. 40, pls. 4, figs. 2, map 1; 22, pp. 52, figs. 2, map 1*).—Except as indicated below, these surveys were made in cooperation with the respective State experiment stations: 1932, No. 40, Jennings County, Ind., H. P. Ulrich et al.; 1933, Nos. 33, the middle Yellowstone Valley area, Mont., W. DeYoung et al., and 34, Audubon County, Iowa, T. H. Benton and W. J. Geib; and 1934, Nos. 21, Zavala County, Tex., H. M. Smith et al., and 22, Ulster County, N. Y., A. T. Sweet and W. Secor ([N. Y.] Cornell).

De Witt County soils, G. D. and L. H. SMITH (*Illinois Sta. Soil Rpt. 67 (1940), pp. 28, figs. 12, maps 2*).—This survey adds 254,450 acres to the total area covered by the State soil survey (*E. S. R., 82, p. 154*).

Analyses of United States soils.—I, North Atlantic States, J. G. LIPMAN, J. S. JOFFE, and A. B. CONYBEARE (*New Jersey Stas., 1940, pp. [91]*).—This first section of an intended compilation of the available soil-analysis data for the country as a whole comprises the compilations for the North Atlantic States—Maine, New Hampshire, Vermont, Connecticut, Massachusetts, Rhode Island, New York, New Jersey, and Pennsylvania. Data for topsoils, subsoils, and the individual horizons of the soil profile are separately given when available. A brief discussion of the data, the methods used in determining them, and their value as an inventory of plant-food resources precedes the tabulated material.

Soil profiles in relation to the recession and extinction of Michigan lakes, J. O. VEATCH. (*Mich. Expt. Sta.*). (*Soil Sci., 50 (1940), No. 2, pp. 103–113, pls. 2, figs. 4*).—The author has made a study of the soil profiles of lakes and of former lake beds with a view to using the resulting information in the formulation of a theory of lake extinction and related phenomena. Some probable mechanisms of lake extinction are discussed and illustrated in diagrammatic drawings, including a series of soil profiles from water surface over bottom ooze and gray sand to a dry-sand profile, and five possible modes of recession and extinction.

Recent advances in soil microbiology, H. NICOL (*Ohron. Bot., 6 (1940), No. 2, pp. 32, 33*).—A review.

Influence of microorganisms on soil aggregation and erosion, J. P. MARTIN and S. A. WAKSMAN. (*N. J. Expt. Stas.*). (*Soil Sci., 50 (1940), No. 1, pp. 29–47*).—A sand-bentonite mixture, a sand-clay mixture, a clay loam, and a sandy loam were treated with various carbohydrates and plant residues, together with both pure and mixed cultures of decomposing organisms. The action of micro-organisms was found to result in a marked binding and aggregation of the soil particles. The extent of the binding depended on the organisms concerned and the nature of the organic material added. The effect of these materials depended on their nature and the rapidity of their decomposition. The more rapidly a plant material decomposed, the greater was its binding action upon the finer soil particles. The effect of lime in bringing about an aggregation of the soil constituents appeared to be associated largely with its effect upon the action of the organic materials.

Two procedures, designated, respectively, as the pipette and slope methods, were used to determine the extent to which the added organic matter and its decomposition products had affected the erodibility and the aggregation of the soil particles. The pipette method consisted essentially in suspending 50 gm. of soil in 250 cc. of water under fixed experimental conditions and drawing off 50 cc. from 5 in. below the surface of the suspension, evaporating the water, and weighing the ignited residue. In the slope method, 50-gm. portions of the material were uniformly spread in the center of a small chute (14.5 by 4.5 in.) placed at a 5.5-percent slope. The material was moistened with 50 cc. of water from a pipette, and 450 cc. of water siphoned from a liter flask was allowed to run over the mixture in approximately 2 min. Then 200-cc. aliquots containing the washed out particles were evaporated to dryness in weighed evaporating dishes, ignited, and weighed. The weight of the small particles washed from 50-gm. portions of the original mixture was taken as unbound material, and final calculation was made on 50 gm. of dry material.

The nature of the catalyst causing the hydrolysis of urea in soils, J. P. CONRAD. (Univ. Calif.). (*Soil Sci.*, 50 (1940), No. 2, pp. 119-134, figs. 4).—The antiseptics toluene and chloroform had little, if any, inhibiting action on the hydrolysis of urea in the soils studied. Carbon disulfide and 50 percent alcohol likewise allowed considerable hydrolysis to take place. The natural soil catalytic activity was inactivated or greatly reduced by preheating the moistened soil to 85° C.; by pretreating the soil with the known urease inhibitors $HgCl_2$, hydroquinone, and catechol; and by predigesting the soil with the proteolytic enzyme trypsin, known to destroy the activity of the protein urease in a very short time. Neither the natural activity nor that of added laboratory jackbean urease could be eluted from the soil by any of the substances commonly used for that purpose. The laboratory urease was moderately adsorbed from solution by preheated Yolo fine sandy loam in various types of procedure. The natural soil activity was found much more resistant to decomposition than that of added laboratory urease. It is suggested that if the activity of the soil is due to an enzyme, urease, it must be associated with some other material which gives it some protection against decomposition, and that a lignoprotein might satisfy such requirements.

Peat and its uses, S. A. WAKSMAN (*New Jersey Stat. Bul.* 681 (1940), pp. 11, figs. 7).—Following a brief statement of the nature and mode of formation of peats, the author describes as the principal forms moss or highmoor peat, sedge and reed peat, forest peat, and sedimentary peat (peat soil, humus, or compost). Of these four forms the three last named are available from large acreages in New Jersey. The preparation of these for marketing and the use of peats as horticultural soils and for soil improvement and other purposes when taken up and marketed are outlined. Cost of drainage and the present excess of agricultural produce are given as the main reasons preventing the wholesale development of the peat bogs for farming purposes. They are considered capable of development into soils among the richest and most valuable in the State.

Relation of pH to phosphate solubility in Colorado soils, R. GARDNER and O. J. KELLEY. (Colo. Expt. Sta.). (*Soil Sci.*, 50 (1940), No. 2, pp. 91-102, figs. 2).—Samples of 12 soils were adjusted to the desired pH values by treating 4 gm. of each soil with 40 cc. of a solution containing suitable proportions of sulfuric acid and potassium carbonate. Colored solutions were treated with bromine, but no other treatment to destroy organic matter was used. The pH values were determined by means of a glass electrode.

It was found that solubility reaches a minimum near the neutral point, that the solubility in the pH range corresponding to the probable range at field

moisture appears to be closely related to plant available phosphorus, that the solubility in the slightly acid range is closely correlated with solubility in the highly alkaline range for soils of similar composition, and that the solubility in the probable range of pH at field moisture is correlated with the degree of colloid saturation as estimated by methods similar to that of Burd and Murphy (*U. S. R.*, 81, p. 482). As practical applications of such data, it is noted that they can serve to indicate whether crops will respond to fertilizer on the soils studied, to indicate the general type of extractants suitable for quick tests of phosphate availability, and possibly as a means of estimating the quantity of phosphate from fertilizer applications which will be adsorbed by the soil in a form not readily available to plants.

Studies on organic phosphorus compounds in soil: Isolation of inositol, R. K. YOSHIDA. (*Hawaii Expt. Sta.*). (*Soil Sci.*, 50 (1940), No. 2, pp. 81-89, pl. 1).—The author isolated crystalline inositol from the organic phosphorus compounds obtained from soils, showing the presence of inositol phosphates in the soils studied. An ash-free organic-phosphorus product isolated from soil was resistant to decomposition and gave inositol and phosphoric acid on hydrolysis, and the phosphorus and nitrogen contents of this substance suggest the ammonium salt of inositol monophosphate. Quantitative estimations of inositol liberated by hydrolysis showed that inositol-phosphate compounds account for only a part of the total soil organic phosphorus. No evidence of nucleic acid compounds could be found in any of the soils investigated.

Accumulation of zinc on soil under long-persistent vegetation, P. L. HIBBARD. (*Univ. Calif.*). (*Soil Sci.*, 50 (1940), No. 1, pp. 53-55).—The author reports zinc determinations at several successive depths in soil under redwood, pine, and oak trees, the zinc content being shown to decrease sharply with increasing depth. When powdered leaf material from the trees named was placed on soil columns and leached with distilled water for some days, none of the zinc extracted from the leaves passed through the soil into the percolate, although the leaf extract itself contained 19%, 22%, and 33% in the leachings from 100 gm. of the leaf material from redwood, pine, and oak, respectively.

Pasture improvement (Vermont Sta. Bul. 463 (1940), p. 14).—Borax (20 lb. per acre) gave some response in the production and maintenance of native white clover in permanent pastures on a light textured soil where generous amounts of lime had been applied.

Commercial fertilizers: Pastures and plant food, L. S. WALKER, E. F. BOYCE, and H. J. CANNON (*Vermont Sta. Bul. 464 (1940), pp. 31*).—This 1940 fertilizer inspection report shows the use of a steadily increasing proportion of non-acid-forming fertilizers. The percentages on non-acid-forming mixtures on the basis of total tonnage sold were, from 1936 to 1940, inclusive, 17.7, 20.1, 21.8, 26.1, and 33.3.

An added section discusses the problems of pasture conservation and improvement. It is pointed out that it is often cheaper to feed cows from the fertilizer bag (through pasture treatment) than directly from the grain bag. Nitrogen, phosphate, potassium, and liming are separately taken up, with brief indications of desirable practice with respect to each.

AGRICULTURAL BOTANY

A manual of aquatic plants, N. C. FASSETT (*New York and London: McGraw-Hill Book Co., 1940, pp. VII+382, figs. [226]*).—Defining an aquatic plant as a plant that may, under normal conditions, germinate and grow with at least its base in the water and is large enough to be seen with the naked eye, the author has

aimed to make possible the identification of aquatic plants in sterile as well as in flowering or fruiting condition. The region covered is from Minnesota to Missouri and eastward to the Gulf of St. Lawrence and Virginia. Part 1 (pp. 3-35) presents a general key, and part 2 (pp. 36-341) descriptive treatment. Appendixes include uses of aquatic plants by birds and mammals, an animal index with bibliography, the relation of plants to fish with bibliography, and a glossary. An index to subjects and illustrations is provided.

Alphabetical catalog of the common and scientific names of the plants of Peru, F. L. HERRERA [y GARMENDIA] (*Catálogo alfabético de los nombres vulgares y científicos de plantas que existen en el Perú*. Lima, Peru: Univ. Mayor San Marcos, 1939, pp. VII+363).—A historical résumé of botanical explorations in Peru, followed by an alphabetical list of the common names of Peruvian plants with their Latin binomial synonyms.

History of the nomenclature of *Acer saccharophorum* Koch (*A. saccharum* Marsh.) from 1753 [trans. title], J. ROUSSEAU (*Nat. Canad.*, 67 (1940), No. 6-7, pp. 161-200, figs. 5).

A descriptive study of varietal forms in *Buxus*, T. H. ALPHIN (*Amer. Jour. Bot.*, 27 (1940), No. 6, pp. 349-357, figs. 3).—Using measurements of boxwood plants and leaves in the form of ratios, viz, height of plant in terms of its diameter and length of leaf in terms of width, it was found that applications of these mathematical relationships to 31 forms, including 4 species, serve as a simple and accurate expression of the differences among varieties and species of the genus.

An extension of the range of *Rynchospora macrostachya*, O. M. NEAL, JR. (Mich. State Col.). (*Rhodora*, 42 (1940), No. 499, p. 276).—York County, Maine, is added to the range.

Brazilian species of *Theobroma* from the systematic and distributional standpoints [trans. title], A. DUCKE (*Rodriguésia*, 4 (1940), No. 13, pp. 265-281, pls. 7; *Eng. abs.*, pp. 274-276).—The genus is indigenous in tropical America from the Amazon region to southern Mexico, nine species having been found in Brazil. A key to and descriptions of these species are given. The seeds of all the species are said to yield chocolate, but only *T. cacao* is cultivated for that purpose in Brazil.

Ecologic notes on the violets of Alachua County, Florida, W. A. MURRILL (Fla. Expt. Sta.). (*Ecology*, 21 (1940), No. 2, pp. 282-284).

A preliminary report on the comparative ages of some important East African trees in relation to their habitats, P. E. GLOVER (*So. African Jour. Sci.*, 36 (1939), pp. 316-327, fig. 1).—After presenting general information on the region covered, the author describes the mbuga, semi-mbuga, subclimax, and climax successional types, and discusses the causes of secondary succession and the ages of a number of trees cut down according to the numbers of their annual growth rings. A possible method of determining the ages of trees by measuring their girth is also outlined, involving formulas for each species.

The mycorrhizal habit in relation to forestry, M. C. RAYNER (*Chron. Bot.*, 6 (1940), No. 1, pp. 12, 13).—A review of recent research.

Studies in range and pasture botany, W. E. LAWRENCE (*Corvallis, Oreg.: OSC Coop. Assoc.* [1940], pp. [185]).—Mimeographed material for use by college students pursuing studies in range and pasture botany. The scope of the subject matter is broad, with special emphasis on ecological relations and Oregon conditions. Suggestions are also given on bibliographic usages suitable for use in research work and reports. The text includes: Introductory aspects of the range problem, life histories of plants, the life history of forage plants,

the physiological life history of a green plant, vegetation and climatic regions of the United States, plant communities indicating growth conditions, climatic life zones and life areas, life zones in Oregon, grazing range areas of the United States, grazing areas of the United States—the physiographic areas, soils and vegetation, plant formations and associations as indicators of soil series, classification of natural vegetation of the United States, grasslands of North America, plant succession in relation to grazing, plant indicators, vegetation types found in western natural lands as indicators of crop, forest, and grazing value, classification of forage types, the grass plant, life history of a grass, selenium poisoning, tarweed, *Sencolo*, greasewood, cocklebur, experiments on nonpoisonous species, preparation of scientific papers, manuals and floras of vascular plants for regions of the United States and Canada, and an index to a few common and scientific names of plants.

The communal nature of the fruiting process in the *Acrasieae*, K. B. RAFFER (U. S. D. A.). (*Amer. Jour. Bot.*, 27 (1940), No. 6, pp. 436-448, figs. 10).—An invitation paper given before the American Association for the Advancement of Science, December 28, 1939, on this group of *Myxomycetes* inhabiting dung, forest litter, and soil.

Guide to the *Mucorineae* (*Mucorales*), N. A. NAUMOV (*Olés des Mucorinées* (*Mucorales*). Paris: Paul Lechevalier, 1939, pp. [1]+187+XXXVII+[1], figs. 82).—This monograph is a translation, by S. Buchet and I. Mouraviev, of the second Russian edition with additional notes by the author and a preface by P. Allorge. The first part gives a general outline of the order *Mucorineae*, and the other three parts present, respectively, empirical keys to the families and genera, keys to the species, and an alphabetical list of all the names of genera and species with their synonyms, so far as known up to 1933. An appendix and bibliography complete the work.

Micrographic studies of fungus spores [trans. title], F. ROSA-MATO (*An. Prim. Reun. Sul-Amer. Bot.*, 2 (1938), pp. 315-324).—Descriptive tabulations and illustrations of spores of species of 26 genera of *Agaricales* are presented. There are 21 references.

Identification of fungi of the genus *Aspergillus* isolated in Montevideo [trans. title], J. E. MACKINNON (*An. Prim. Reun. Sul-Amer. Bot.*, 2 (1938), pp. 215-231, pls. 4).—Descriptions are included for 11 species isolated from various substrates, including man and animals.

A new species of the genus *Dendrothele* [trans. title], A. P. VIEGAS (*Rodriguésia*, 4 (1940), No. 13, pp. 283-287, pls. 3; *Eng. abs.*, p. 286).—*D. alba* n. sp. (*Thelephoraceae*) is described as occurring on dead limbs of *Moquinia polymorpha*.

Mycological study of a strain of *Monascus ruber* isolated from a tomato catsup [trans. title], P. NEGRONI (*An. Prim. Reun. Sul-Amer. Bot.*, 2 (1938), pp. 243-249, pls. 3).—Data on the morphology and cultural and physiological characters are presented.

Observations on *Amanita muscaria* in Uruguay [trans. title], F. ROSA-MATO (*An. Prim. Reun. Sul-Amer. Bot.*, 2 (1938), pp. 309-314, pls. 6).

Polyperi of Rio Grande do Sul, Brazil [trans. title], R. RICK (*An. Prim. Reun. Sul-Amer. Bot.*, 2 (1938), pp. 271-307).—Descriptions of species and varieties of *Ganoderma*, *Amauroderma*, *Lignosus*, and *Polyporus*, including new taxonomy.

The *Polyporaceae* of Bahia and bordering States [trans. title], C. TORREND (*An. Prim. Reun. Sul-Amer. Bot.*, 2 (1938), pp. 325-341; *Fr. abs.*, p. 341).—Descriptions are presented of species of nine genera of this fungus family in northern Brazil, with special reference to the State of Bahia.

The genus *Polystictus* in Rio Grande do Sul, Brazil [trans. title], J. RICK (*An. Prim. Reun. Sul-Amer. Bot.*, 2 (1938), pp. 251-270).—Descriptions of species and varieties of this genus of the Polyporaceae are given, including new taxonomy.

Fungistatic properties of the fatty acids and possible biochemical significance, C. HOFFMAN, T. R. SCHWEITZER, and G. DALBY (*Food Res.*, 4 (1939). No. 6, pp. 539-545, figs. 6).—The fungistatic properties of the normal saturated fatty acids containing 1-14 carbon atoms were studied at pH 2-8. Many exhibited remarkable effectiveness in inhibiting mold growth, varying according to the chain length, acid concentration, and pH of the media. A branched chain acid, in general, proved less effective fungistatically than the corresponding straight chain acid. Unsaturation tended to increase the effectiveness. At neutrality, the acids containing 8-12 carbon atoms were the most effective in inhibiting mold growth. This suggested that the nutritional value of these fatty acids should be studied in relationship to certain types of disease, and the theory is advanced that the shorter chain fatty acids may prove important in human dietary.

The harmful effect of direct and alternating currents on plant growth, E. BURSTEIN, L. M. ALIMINOSA, and L. MORIBER (*Electrochem. Soc. Trans.*, 77 (1940), pp. 501-515, figs. 6).—The growth retardation in the anode plants resulting from passage of a D. C. through the entire coleoptile proved greater than that occurring in the cathode plants. This difference is shown to follow a growth trend similar to that obtained by others with potentials either induced or applied. The D. C. retarded the growth of the coleoptile regardless of whether the anode or the cathode was at the tip. Current flow as a complicating factor may account for the discrepancy in results by various workers on the movement of auxin under a potential gradient. Results of tests with D. C. through the tip and through the base of the coleoptiles indicate that the effect of the D. C. is greatest in the apical region. The effect of a D. C. of 1 μ a. passing through the entire coleoptile is entirely due to the action of current on the tip portion. D. C. passing through the tip of the coleoptile is presumed to decrease the supply of growth substances to the basal region. The influence of current on growth is discussed in terms of effect on auxin supply and on the complex protoplasmic system. A. C. retarded growth to a much smaller extent than D. C. The effects of A. C. as compared with D. C. are linked with the different effects on pH, permeability, and electrical charges on cell membranes.

Heat resistance of several spring wheats as shown by laboratory tests, E. A. HELGESON and K. L. BLANCHARD (*North Dakota Sta. Bimo. Bul.*, 3 (1940), No. 1, pp. 5, 6).—Preliminary tests under controlled conditions with Ceres, Thatcher, Premier, and Hope wheat varieties placed them in this order with respect of high temperature resistance. So far as Ceres, Thatcher, and Hope are concerned these results correspond with field observations on their drought resistance. It is hoped that a standardized method along these lines may be worked out which will speed up the breeding and testing program.

The responses of shoots of mungo bean seedlings growing in solutions of 3-indole-acetic acid, E. W. GROSS (*Amer. Jour. Bot.*, 27 (1940), No. 6, pp. 371-376, figs. 5).—When mungo bean seedlings 24 hr. old were transferred from damp chambers to paper-lined beakers containing serial dilutions of 3-indoleacetic acid and to control beakers of distilled water, all the experimental hypocotyls (except those in 0.001 mg. concentration per liter) 3 days after soaking were reduced in size as compared with the controls. Seven days after soaking all the treated hypocotyls showed a slight gain over controls,

and the epicotyls were also taller. At the 7- and 3-day intervals growth responses were correlated with the amount of growth substance used. When day-by-day measurements were made the results agreed substantially with those of the first two experiments. In addition, it was observed that at the 4-day interval the treated epicotyls, when measured for the first time, were markedly shorter than the controls.

Tests on after-effects of auxin seed treatment, P. S. TANG and S. W. LOO (*Amer. Jour. Bot.*, 27 (1940), No. 6, pp. 385, 386).—White mustard grown from seed first treated for 24 hr. in an aqueous solution of 3-indoleacetic acid (1 mg./l., 10 mg./l., and 100 mg./l.) showed accelerated leaf production in the preflowering period and notable and progressive shortening of that period with the two higher concentrations. For these concentrations the number of leaves at vegetative maturity was also reduced, this effect also being most pronounced for the highest concentration. Mustard, tomato, and rice grown from auxin-treated seed usually came into bloom 3-7 days earlier than untreated controls.

Factors influencing the protoplasmic streaming in the oat coleoptile, R. A. OLSON and H. G. DU BUY. (*Univ. Md.*). (*Amer. Jour. Bot.*, 27 (1940), No. 6, pp. 392-401, figs. 7).—Developing a more reliable and more readily carried out method of measuring protoplasmic streaming through the use of dark field illumination, an entirely objective photographic recording of the rate was devised, depending on the length of the streak on a film made by a moving particle during a given exposure time. The effect of ethyl ether on protoplasmic streaming was determined. No increase in rate was caused, but marked inhibition was found with the higher concentrations (10 gm./l.-32 gm./l.). No marked increase in rate of streaming by indoleacetic acid at 0.001-10 mg./l. could be found, but above this range inhibition was observed. The effect of 2-4-dinitrophenol on streaming proved to be permanent and toxic at concentrations of 50 and 100 mg./l., with no effect at 1 mg./l. No increase of streaming by methylene blue from 10^{-4} molar to 10^{-3} molar concentration could be shown, but above this range inhibition occurred. KCN inhibited the streaming only 50 percent even in concentrations as high as N/100.

The relation between respiration, protoplasmic streaming, and auxin transport in the Avena coleoptile, using a polarographic microrespirometer, H. G. DU BUY and R. A. OLSON. (*Univ. Md.*). (*Amer. Jour. Bot.*, 27 (1940), No. 6, pp. 401-413, figs. 15).—"The dropping mercury electrode has been adapted to the measurement of the respiration of a single coleoptile section. There occurs at a definite low oxygen concentration a critical point in the respiration process at which a new and lower rate of respiration persists. This lower rate is about 50 percent of the normal rate. This limiting concentration is lower for old coleoptiles than for young coleoptiles. KCN limits the rate of respiration to the same extent that it limits the rate of streaming. The inhibited rate of respiration is about the same as that which is brought about by low O_2 tension. 2-4-Dinitrophenol inhibits the rate of respiration to the same degree that it limits streaming. Indole-3-acetic acid alone or in the presence of fructose has no effect on respiration except in the higher concentrations (25-100 mg./l.) where it inhibits respiration. KCN limits the transport of auxin to the same degree and in the same concentrations that it limits protoplasmic streaming and respiration. 2-4-Dinitrophenol decreases the transport of auxin to the same extent and in the same concentration that it decreases protoplasmic streaming and respiration."

Studies on *Chlorella vulgaris*.—II, Further evidence that *Chlorella* cells form a growth-inhibiting substance, R. PRATT and J. FONG. (*Univ. Calif.*). (*Amer. Jour. Bot.*, 27 (1940), No. 6, pp. 431-436, figs. 6).—In continuation

(E. S. R., 83, p. 39) of these studies, multiplication of this green alga in a nutrient solution exposed to continuous light from Mazda lamps and through which a gas mixture composed of 5 percent CO_2 and 95 percent air continuously bubbled was used as a measure of growth. Under these conditions growth was relatively unaffected by changes in total salt concentration of the nutrient solution from 0.01 to 0.1 mole per liter.

"When nutrient media prepared with solutions in which growth had occurred but from which all cells had been removed were inoculated, it was found that growth was inhibited by the presence of filtrate in the medium, that the depression of growth increased as the percentage of filtrate in the medium increased, that for a given concentration of filtrate in the medium the depression of growth varied inversely with the initial density of population, and that the depression of growth increased with the physiological age of the filtrate."

Using this method, evidence is presented that seems to demonstrate clearly that *C. vulgaris* cells produce and liberate into the external solution a substance that tends to retard their growth. This substance may be formed in proportion to the metabolic activity of the cells. Probably the reduced growth rates are manifestations of general metabolic sluggishness.

Improvements in the simplified method for osmotic measurements, C. J. LYON (*Plant Physiol.*, 15 (1940), No. 3, pp. 561, 562).—This note presents certain refinements in the technic of a previously published adaptation by the author of A. Ursprung's simplified method.¹

Effect of soil moisture on growth and transpiration in *Helianthus annuus*, E. V. MARTIN (*Plant Physiol.*, 15 (1940), No. 3, pp. 449-466, figs. 4).—Russian Mammoth sunflowers were grown in containers holding ± 130 lb. of dry soil under conditions of different holard, using two methods, viz. (1) with the holard maintained near field capacity by frequent additions of water and with other plants allowed to remove about two-thirds of the available soil moisture before replenishment, and (2) with four groups of plants grown in soil mixed at holards of ± 11 , 14, 17, and 20 percent of the dry weight of the soil, no water being added at any time thereafter. The wilting coefficient of this soil was 7 percent and the field capacity 18 percent.

In all series, lower holard resulted in reduced growth. In tests using method (1) water requirement and shoot-root ratio increased with greater available water, but in those using method (2) neither was appreciably altered. Stomata were smaller and more numerous on plants with less available water. The leaves were also thinner, but the palisade:sponge tissue ratio was unchanged, the anatomical changes apparently being due to failure of the cells to expand normally because of reduced turgor. Growth rates were affected by even small differences in holard, and were affected by reduced holard long before any effect on stomatal opening or transpiration rate per unit area could be detected. The transpiration rate per unit of leaf surface was usually affected when about two-thirds of the available soil moisture had been removed. The stomatal opening appeared unaffected unless the holard was reduced sufficiently to lower transpiration. In all cases in which the transpiration rate and stomatal opening were affected, the leaves showed signs of wilting. Rate of increase in leaf area fell off as the soil moisture was reduced, but after watering recovered to a value greater than that of controls. This effect was believed due largely to recovery of turgor. No increase in rate of transpiration per unit area of leaf surface in plants recovered from wilting above that of controls could be detected. There are 19 references.

¹ *Plant Physiol.*, 11 (1936), No. 1, pp. 167-172.

Growing plants without soil, F. S. SCHLENKER and R. S. BELL (*Rhode Island Sta. Misc. Pub.* 7 (1940), pp. [12], figs. 4).—A brief conspectus of the subject.

The assimilation of ammonia nitrogen by the tobacco plant: A preliminary study with isotopic nitrogen, H. B. VICKERY, G. W. PUCHER, R. SCHOENHEIMER, and D. RITTENBERG. (Conn. [New Haven] Expt. Sta. et al.). (*Jour. Biol. Chem.*, 135 (1940), No. 2, pp. 531-539).—"When ammonium chloride that contains nitrogen of atomic weight 15 is administered for a short period to rapidly growing plants, the isotope can be promptly detected in all parts of the tissues. The ammonia absorbed is rapidly assimilated into the nitrogen of amides and amino acids and into the proteins. The concentration of isotope in the nitrogen suggests greatest intensity of assimilation in the roots and least in the leaves; on the other hand, the greatest quantity of isotopic nitrogen was found in the leaves. Much of the chemical change can be accounted for as a result of growth during the experimental period, but the quantity of isotope found in the proteins of the tissues was appreciably in excess of that to be expected from growth alone. This excess is apparently the result of continuous chemical interaction between the nitrogen of the tissue constituents and that of the nutrient. In the course of these reactions isotopic nitrogen is introduced into the proteins. This is held to furnish an example of the normal process of nitrogen assimilation. There is a close and striking analogy to the type of continuous chemical reaction in which the tissue proteins of mature animals in nitrogen equilibrium have already been observed to be concerned."

Growth and differentiation of maize in relation to nitrogen supply, P. R. BURKHOLDER and I. McVEIGH. (Univ. Mo.). (*Amer. Jour. Bot.*, 27 (1940), No. 6, pp. 414-424, figs. 10).—Under varied supplies of nitrogen, 12 inbred lines and 9 hybrids of corn were grown in nutrient sand cultures for 5, 7, or 8 weeks, when observations were made on fresh and dry weights of the shoots and roots, development of apical growing points, growth of parenchyma cells in the stems, and differentiation of vascular tissues. Differential growth of the lines and hybrids was observed particularly in response to the higher N increments. All hybrids exceeded either one or both parental lines in dry matter produced under high-N conditions, though some were little if any better than the more vigorous parent. Apical meristematic regions developed more rapidly in the hybrids and in direct proportion to the amount of N supplied. Considerable differences were noted in rates of development among inbreds and hybrids. Stem diameters and both number and size of the constituent parenchyma cells increased directly with the N supply. Plots of the logarithm of cell size in microns against the logarithm of stem diameter in millimeters yielded straight lines with the slopes differing among the different kinds of corn. The vascular bundles were more numerous and contained larger and better differentiated elements in direct proportion to the stem diameters. Hybrid vigor in crosses superior in their ability to produce dry matter and to differentiate organs was not correlated with greater growth and development of the vascular tissues. Size and differentiation of cells in the xylem and phloem were directly proportional to N supply.

An apparatus for the continuous recording of light intensity in foot candles (graphic light meter), K. POST and M. W. NIXON. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), p. 278).—An abstract.

An environment-control chamber for study of photosynthesis, respiration, and transpiration of horticultural plants, N. F. CHILDERS and H. W. BRONX. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 384-390, figs. 3).—Detailed plans are presented of a chamber, used successfully for over a year, in which it was possible to maintain a temperature within 1.5° F. over

a range of 35°-120°, a relative humidity within 1 percent over a range of 0-95 percent, and light from 500 footcandles at floor level to 8,000 near the ceiling. Inside dimensions are 7 by 8 by 8 ft., and the cost of building materials and equipment (excluding the photosynthesis machine) was about \$1,500.

Studies on the chlorophylls and photosynthesis of thermal algae from Yellowstone National Park, California, and Nevada, O. L. INMAN (*Jour. Gen. Physiol.*, 23 (1940), No. 6, pp. 661-666).—Myxophyceae normally growing at 65° C. evolved oxygen on irradiation and gave evidence of retaining the power to carry on photosynthesis at 20°, indicating that extra thermal energy is not essential for photosynthesis at least over a short period of time. Chlorophylls a and b found in several species growing in water at 37°-72° were essentially the same as found in plants the world over. Certain standard chemical and spectroscopic tests for the chlorophylls were used as criteria for these comparisons. The ratio of chlorophyll a and b often varied considerably, but in general chlorophyll a showed an increase over the percentage found in most plants. Green algae (*Chlorella* sp.?) were the only forms found at "The Geysers," Sonoma County, Calif. The temperature of the waters from which collections were made was 49°-66°. Collections from Beowawe, Nev., were from waters at 60°-71°. The algae belonged to the Myxophyceae, and the species were like some of those found in Yellowstone National Park. In some of the calcareous regions of the latter, spectroscopic study of the chlorophylls revealed an unidentified absorption band at 548 m μ .

The reduction of ferric oxalate by isolated chloroplasts, R. HILL and R. SCARISBRICK (*Roy. Soc. [London], Proc., Ser. B*, 129 (1940), No. 855, pp. 238-255, figs. 7).—Isolated chloroplasts of *Stellaria media* showed a progressive fall in activity approaching zero in 3-6 hr. Four strains of the plant were grown which showed differences in chloroplast stability after their removal. The activity of the chloroplasts was measured by two methods described. The Q_{O_2} , measured as rate of oxygen production calculated on the basis of dry weight of leaf taken, was ± 20 ; when measured as rate of methemoglobin reduction, it generally appeared less as the reduction of methemoglobin by ferrous iron was relatively low. The reduction of methemoglobin in presence of ferric potassium oxalate was studied quantitatively from the viewpoint of iron, methemoglobin, and chloroplast concentration. The effect of different light intensities on the ferric oxalate reaction was similar to that of varying light intensity on photosynthesis in whole plants and lay within the range of values noted by different workers. The ferric oxalate reaction was inhibited by urethane. Phenyl urethane inhibited in much smaller concentrations than ethyl urethane. The effective concentrations of urethane were similar to those affecting photosynthesis. It is concluded that the light reaction in plant photosynthesis is the production of the O_2 molecule and is not the reduction of CO_2 .

Starch formation in tobacco plants deficient in potassium, D. DAY (*Plant Physiol.*, 15 (1940), No. 3, pp. 367-375).—Using tobacco plants grown from seedlings in sand culture in complete nutrient solution and in similar solution with potassium phosphate replaced by sodium phosphate, the leaves were cut separately and their fresh and dry weights ascertained, and quantitative determinations of starch were made by the iodine precipitation method of Pucher and Vickery (*El. S. R.*, 79, p. 9). Controls grew normally, with more and larger leaves having greater fresh and dry weights than those without potassium. The proportion of dry matter in the leaves was greater in the controls and decreased from top toward base, i. e., decreased water content was associated with K deficiency. The supply of K was apparently correlated with capacity to store starch, since the maximum amount of starch in the leaves of the controls

in each series was greater than the maximum in plants without K. There are 24 references.

Separation of potassium isotopes in *Valonia* and *Nitella*, A. G. JACQUES (*Jour. Gen. Physiol.*, 23 (1940), No. 6, pp. 741-742).—"The ratio of K^{39} : K^{41} appears to be lower in the sap of *Valonia* and *Nitella* than in the environment, indicating that the living cell can separate these isotopes to some extent. Experiments with a mixture of guaiacol and *p*-cresol suggest that a similar separation may occur here, but further experiments are needed."

Action curves with single peaks in *Nitella* in relation to the movement of potassium, W. J. V. OSTERHOUT and S. E. HILL (*Jour. Gen. Physiol.*, 23 (1940), No. 6, pp. 743-748, figs. 6).—"In *Nitella* the action curve has two peaks, apparently because both protoplasmic surfaces (inner and outer) are sensitive to K^+ . Leaching in distilled water makes the outer surface insensitive to K^+ . We may therefore expect the action curve to have only one peak. This expectation is realized. The action curve thus obtained resembles that of *Chara*, which has an outer protoplasmic surface that is normally insensitive to K^+ . The facts indicate that the movement of K^+ plays an important part in determining the shape of the action curve."

The physiological basis of plant nutrient deficiency symptoms, E. E. DeTURK (*Amer. Fert.*, 93 (1940), No. 5, pp. 8, 22).—An abstract.

Salient features of the method of foliar diagnosis, W. THOMAS and W. B. MACK. (Pa. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 56 (1939), pp. 253-260, figs. 5).—"The graphic representation of the three-component system nitrogen, phosphoric acid, and potash, which plays a major role in the physiology of plant nutrition, is described in detail. The relationship of the optimum in the pure science of physiology to the optimum in practical agriculture is discussed in terms of the experimental facts established by the method. The foliar diagnosis values of the known optimum serve as a base of reference for all other modes of nutrition obtained for a particular species. The reciprocal effects, or the action of one element on another, are discussed in relation to their influence on the 'nutrient balance' through displacement of the intensity of nutrition and the $N-P_2O_5-K_2O$ equilibrium. Conclusions of practical importance are drawn from the facts. The method of foliar diagnosis applied to a particular species in a particular soil in a given year is an incontestable means of control by indicating the direction in which nutritional modifications are required."

Effects of guaiacol and hexylresorcinol in the presence of barium and calcium, W. J. V. OSTERHOUT (*Jour. Gen. Physiol.*, 23 (1940), No. 6, pp. 749-751).—"Guaiacol was applied at two spots on the same cell of *Nitella*. At one spot it was dissolved in 0.01 M NaCl, at the other in 0.01 M $CaCl_2$ or $BaCl_2$. The effect was practically the same in all cases, i. e., a similar change of P. D. [potential difference] in a negative direction involving a more or less complete loss of P. D. (depolarization). When hexylresorcinol was used in place of guaiacol the result was similar. That Ca^{++} and Ba^{++} do not inhibit the effect of these organic depolarizing substances may be due to a lack of penetration of Ca^{++} and Ba^{++} . The organic substances penetrate more rapidly, and their effect is chiefly on the inner protoplasmic surface which is the principal seat of the P. D."

Cation exchange in plant roots in relation to metabolic factors, T. C. BROYER and R. OVERSTREET. (Univ. Calif.). (*Amer. Jour. Bot.*, 27 (1940), No. 6, pp. 425-430, figs. 4).—"In a previous paper (E. S. R., 76, p. 457) results were reported on the general nature of salt accumulation by excised barley roots. In the present contribution, employing radioactive isotopes as indicator ions,

further evidence is given that favorable temperature and aerobic cultural conditions are requisite for continued net inward movement of cations. Ionic exchange movements may occur during periods of and under conditions favorable for active solute accumulation. Observed ionic movements are net values, related in part at least to certain two-directional exchange movements of ions associated with, although not depending directly on, metabolic processes and to a lesser degree to those associated merely with colloidal conditions apart from metabolic influences. Some outward movement of cations may occur from regions more deeply seated than the root surface. Under the experimental conditions, aeration was not directly involved in the exchange movements of cations. Temperature had a small and possibly a variable effect in this respect, in contrast to the large influence of temperature on the accumulation movement against a gradient of electrolyte.

The balance sheet of metabolites for potato discs showing the effect of salts and dissolved oxygen on metabolism at 23° C., F. C. STEWARD, P. R. SROUT, and C. PRESTON. (Univ. Calif. et al.). (*Plant Physiol.*, 15 (1940), No. 3, pp. 409-447, figs. 2).—In this second paper on the biochemistry of salt accumulation by plants (E. S. R., 83, p. 320), a summary is presented of the effects of various salt and oxygen treatments so chosen that they comprise a range of conditions of peculiar interest to the subject. The KNO_3 and CaBr_2 treatments, in which anion exceeded cation uptake, increased the bicarbonate concentration and alkalinity of the external solution. In aerated solutions K salts stimulated and Ca salts depressed water absorption in a way not wholly explicable by osmotic phenomena. At O_2 tensions such that respiration was not limited thereby, the respiratory behavior of potato disks was determined by the salts in the external solution. The effect of low O_2 concentrations on respiration was confirmed. All the treatments increased the sugar concentration. The salt and O_2 treatments which stimulated respiration produced a low, residual sugar concentration. The sugar concentration did not regulate the respiration rate.

At a low O_2 concentration at which Br accumulation was depressed, synthesis of protein from amino acid was also limited by O_2 lack. In aerated distilled water protein synthesis occurred, and this was increased by KBr in the external solution but was decreased by CaBr_2 . Dilute KNO_3 produced the greatest observed effect on protein synthesis. An approximately linear relationship occurred between the protein synthesized and the CO_2 respired. Approximately one-third of the respiration of disks in aerated distilled water was produced independently of N metabolism, and this component of the total respiration was not affected by salts or O_2 concentration. Two-thirds of the respiration of disks in distilled water arose from a component of respiration which was linked to protein synthesis from amino acids, was affected by salts and O_2 concentration, and was involved with the oxidase system. The effects of inorganic ions on respiration paralleled their effects on protein synthesis. The characteristic effects of ions on respiration and synthesis were exerted at O_2 tensions at which their absorption occurred, and the reactions of the ions observed therefore constituted an integral part of the mechanism of salt absorption.

Discrepancies in the balance sheet proved to be due to the transfer of organic substance from the surface of those disks which had been in aerated KBr solution or distilled water to the drying papers used to remove surface water. The surface film removed was formed at the expense of the starch fraction and consisted of a complex rich in uronic acid. It is now believed that losses of Mg are attributable to a similar cause. Volatile organic compounds were produced by potato tissue under the test conditions only in small amounts.

A revised balance sheet embodies corrections for all the above processes and summarizes satisfactorily the principal processes occurring in potato disks under conditions conducive to salt uptake and the effects of salts and O_2 on them at 23° . Amino acids and sugar supply the C for the protein molecule and the extra respiration entailed in its production. In the fixation of nitrate N, C is derived from organic acids. The latter disappear during protein synthesis from amino acids and probably contribute here also to the C framework of the protein molecule. The implication of the data is that all of the energy liberated by respiration is absorbed by the surroundings as heat. The significance of the results relative to current views on respiration and salt uptake is discussed. There are 51 references.

Legumes and legume bacteria (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 221-228).—Abstracts of the following papers are of botanical interest: A Suggested Explanation of the "Inefficiency" of Certain Strains of *Rhizobium* sp., by H. G. Thornton; Mechanism of Symbiotic Nitrogen Fixation by Leguminous Plants, by A. I. Virtanen; The Physiology of Nodule Formation, by K. V. Thimann; Studies on the Mechanism of Symbiotic Nitrogen Fixation, by W. W. Umbreit and P. W. Wilson (Univ. Wis.); Respiration Rates of *Rhizobium*—Their Estimation and Significance, by F. E. Allison and S. R. Hoover (U. S. D. A.); The Lyso-Resistance of *B[acterium] radicola* [= *Rhizobium leguminosarum*] and Its Practical Importance, by A. Demolon and A. Dunez; Bacteriophage and the Legume Bacteria, by H. Katznelson (N. J. Expt. Stas.); Symbiotic Promiscuity in the Leguminosae, by J. K. Wilson (Cornell Univ.); Bacteria Associated With *Gleditsia triacanthos* L., by L. T. Leonard (U. S. D. A.); and Some Soil Factors in Nitrogen Fixation by Legumes, by W. A. Albrecht (Univ. Mo.).

Carbohydrate supply and legume symbiosis, F. E. ALLISON and C. A. LUDWIG. (U. S. D. A.). (*Chron. Bot.*, 6 (1940), No. 1, pp. 8, 9).—A review of recent research.

The structure of "ineffective" nodules and its influence on nitrogen fixation, H. K. CHEN and H. G. THORNTON (*Roy. Soc. [London], Proc., Ser. B*, 129 (1940), No. 855, pp. 208-229, pls. 2, figs. 8).—The anatomy and cytology of nodules on clover, peas, and soybeans produced by "effective" v. "ineffective" *Rhizobium* strains were studied with special reference to the volume changes in the active infected tissue during the life of the nodule. In clover the mean value of this active bacterial tissue was about three times as great in the effective nodules, due to an arrest in growth of nodules produced by ineffective strains. In all nodules the active bacterial tissue eventually disintegrated, but in effective clover nodules it remained without disintegration about six times as long. In a test of N fixation by clover inoculated with an effective and an ineffective strain, the difference in the amounts of N fixed could be accounted for by the differences in volume and duration of the active bacterial tissue. In peas, nodules produced by an effective strain were nearly twice the length and their bacterial tissue remained without disintegration about twice as long as with an ineffective strain. In soybeans, the mean volume of bacterial tissue was 4.75 times as great in the effective nodules, and the percentage of that volume composed of infected cells was twice as great. In ineffective soybean nodules disintegration of the bacterial tissue began when the plant was about 4 weeks old and was practically complete by the twelfth week, at which time no disintegration could be observed in effective nodules. The difference in amount of N fixed by soybean plants bearing each type of nodule could be accounted for wholly by the factors mentioned. Thus in both clover and soybean nodules the volume and duration of the active infected tissue were the main if not the only factors determining differences in N fixation among the strains studied.

Elements of botanical microtechnique, J. E. SASS (*New York and London McGraw-Hill Book Co., 1940, pp. IX+222, figs. 33*).—This manual was evolved over a period of years in connection with the teaching of a college course in histological methods. Since it is primarily a training manual rather than a reference work, use is made of a graded series of assignments, beginning with subjects in which orientation is easily visualized, few sectioning difficulties are encountered, and a simple stain is used. The two main parts of the text deal, respectively, with general principles and with specific methods.

Comparative morphology of stamens [trans. title], H. SCHAEFFI (*Chron. Bot., 6 (1940), No. 1, pp. 4, 5*).—A general discussion.

Contribution to the study of potato pollen [trans. title], E. L. RATERA (*Buenos Aires Univ., Inst. Genét. [Pub.], 1 (1940), No. 4, pp. 19, figs. 12*).—The author presents observations of some varieties of the cultivated potato and related wild species with respect to a method of determining the fertility of the pollen and its quantity, quality, germinability, and morphology.

The relation of internal surface to intercellular space in foliage leaves, F. M. TURRELL. (*Calif. Citrus Expt. Sta.*). (*Science, 92 (1940), No. 2385, p. 244*).—The coefficients of correlation between the internal-external surface ratio and the volume of intercellular space per sample area are presented for 20 leaves of 4 alfalfa plants and for random samples of leaves of 16 angiosperm species from various parts of the world.

The xylem anatomy, relative water conductivity, and transport of dyes in citrus stems, E. DE VILLIERS (*So. African Jour. Sci., 36 (1939), pp. 291-313, figs. 10*).—Material of rough lemon, sour orange, and grapefruit for the anatomical studies was obtained from trees grown at the University of Pretoria and was compared with material of the same species sent from California. As a result of this study, it is believed possible that differences in anatomy and water conductivity may influence the compatibility of the different species and be of importance in explaining the failure of sour orange as a stock in South Africa. Dyes and salts introduced into one root of citrus may be transported to branches on all sides of the tree. Substances transported in the youngest xylem, however, are mainly found on one side of the tree, in which case the substances may travel around some of the branches without entering them. In the older xylem there is a better tangential distribution of dyes than in the younger. Substances transported in the older xylem may enter all branches. This may be explained by the profuse branching of and irregular course followed by the xylem vessels. There are 18 references.

Proceedings of the local branches of the Society of American Bacteriologists (*Jour. Bact., 40 (1940), No. 2, pp. 326, 327, 331, 332, 333, 334*).—Abstracts of the following papers are of interest to botany: *The Physiology of Luminescence and Respiration of Luminous Bacteria*, by F. H. Johnson; *Production of Citric Acid by Willia anomala*, by H. C. Murray (Purdue Univ.); *Growth of Some Non-Sporulating Anaerobic Bacteria in Synthetic Media and Extracts From Corn Silk*, by R. A. West, Jr., K. H. Lewis, and W. E. Militzer (Univ. Nebr.); *Respiration Studies on Resting Cells of Rhicobium meliloti*, by J. T. Kronlik and P. L. Gainey (Kans. Expt. Sta.); *Bacteria as Colloids*, by T. M. McCalla (Kans. State Col.); and *Studies on Natural Bacteriolysins*, by W. R. Miller.

The taxonomy of the genus Bacillus.—I, Modes of spore germination, C. LAMANNA. (Cornell Univ.). (*Jour. Bact., 40 (1940), No. 3, pp. 347-360, pl. 1, figs. 29*).—It is claimed that when the modes of spore germination are clearly defined and separated they have taxonomic value, and that the spore germination of a given type is constant for any one culture and species. The modes thus far found are summarized.

Studies on the thermal sensitivity of marine bacteria, J. E. ZOBELL and J. E. CONN. (Univ. Calif.). (*Jour. Bact.*, 40 (1940), No. 2, pp. 223-238).—Most of the bacteria isolated from the sea grew best at temperatures considerably above their marine environment. Although nearly all multiplied slowly at near zero, true psychrophiles were not found. Many of the marine bacteria proved sensitive to the planting temperature. Only 20 percent survived 40° C. for 10 min., and the respiratory enzymes of some forms were inactivated at 30°. Nutrient agar inoculated with sea water or marine sediments yielded maximum colony counts when incubated at 18°-22° for 1-2 weeks, and very few colonies developed at 30°-37°. There are 26 references.

Heavy carbon as a tracer in bacterial fixation of carbon dioxide, H. G. WOOD, C. H. WERKMAN, A. HEMINGWAY, and A. O. NIER. (Iowa Expt. Sta. and Univ. Minn.). (*Jour. Biol. Chem.*, 135 (1940), No. 2, pp. 789, 790).

A comparison of cobalt and nickel salts with other agents for the detection of hydrogen sulfide in bacterial cultures, W. P. UTERMÖHLEN, JR., and C. E. GEORGE. (Univ. Nebr.). (*Jour. Bact.*, 40 (1940), No. 3, pp. 449-459).—The toxicities of Ni and Co ions for a number of bacteria in broth cultures were determined, and a medium containing proteose peptone, cysteine, glucose, dipotassium phosphate, Ni and Co nitrates, agar, and water was developed which is said to compare well with present established media for detecting H₂S production by bacteria. It was shown that detection (and perhaps production) of H₂S in bacterial cultures varies greatly according to the medium and the indicator used—all factors thus need to be specified. The possible causes of this variation are discussed. There are 16 references.

Inhibiting effect of acetic acid upon micro-organisms in the presence of sodium chloride and sucrose, A. S. LEVINE and C. R. FELLERS. (Mass. Expt. Sta.). (*Jour. Bact.*, 40 (1940), No. 2, pp. 255-269, fig. 1).—Acetic acid inhibited bacterial growth almost exactly in proportion to the amount present. The order of decreasing resistance to acetic acid was *Bacillus cereus*, *Salmonella aertrycke*, *Staphylococcus aureus*, and *Phytomonas phaseoli*. Naturally, *Saccharomyces cerevisiae* and *Aspergillus niger* were inhibited at a higher acid concentration than the bacteria, the yeast being the more resistant of the two. At equivalent pH values the greater toxicity was usually noted with the greater amount of acid. Apart from the indirect effect in altering the pH, the salt and sugar aided the acetic acid but little in its toxic effect on bacteria and yeast, nor did they exert appreciable effects on the minimum percentage of acidity required for total destruction of these organisms. Evidence is presented that the toxic action of acetic acid on micro-organisms is not confined to the pH alone. When *A. niger* was inoculated into a series of flasks of glucose broth containing different concentrations of acetic acid, growth was inhibited at pH 4.1 and at a total acidity of 0.27 percent. Addition of 5 percent salt or 20 percent sucrose did not significantly change these growth limits. Acetic acid in nontoxic amounts promoted the development of *A. niger* by supplying energy. At acetic acid concentrations of 0.1-0.17 percent no inhibition of mold growth resulted from adding 5 percent NaCl. On the other hand adding 20 percent sucrose markedly stimulated growth. Maximum mold growth was obtained in a 20 percent nutrient sucrose solution at pH 4.4 containing 0.16 percent acetic acid.

A photomicrographic study of the rate of growth of some yeasts and bacteria, G. KNATSL. (Cornell Univ.). (*Jour. Bact.*, 40 (1940), No. 2, pp. 247-253, figs. 2).—The growth rate in substance of the *Schizosaccharomyces pombe* cell became nil or nearly so at the time of cell division. *Bacillus cereus* cells showed no such correlation in an actively growing culture, although the growth rate fluctuated within the life span of the cell.

The biochemical classification of yeast strains, A. S. SCHULTZ, L. ATKIN, and C. N. FREY (*Jour. Bact.*, 40 (1940), No. 3, pp. 339-346).—Examination of 44 yeast cultures described as strains, varieties, or races of *Saccharomyces cerevisiae* or *S. carlsbergensis* has shown that they may be subdivided into three types on the basis of their vitamin relations.

Yeasts occurring on grapes and in grape products in California, E. M. MRAK and L. S. McCLUNG. (Univ. Calif.). (*Jour. Bact.*, 40 (1940), No. 3, pp. 395-407, fig. 1).—The authors report that 241 cultures of yeasts were isolated from California grapes and grape products, of which 82 were imperfect and 159 ascospore-forming. The species found, including 2 new species of *Torulopsis* and 1 of *Asporomyces*, are discussed. There are 26 references.

GENETICS

Diploidy, polyploidy, and winter hardiness relationships in the flowering plants, W. M. BOWDEN (*Amer. Jour. Bot.*, 27 (1940), No. 6, pp. 357-371, figs. 16).—A scale of relative degree of winter hardiness was constructed for comparing the cold resistance of related species in families ranging from the temperate zone to the Tropics. The data thus far obtained are arranged in an extensive table, showing the author's chromosome number determinations of 100 species and varieties of angiosperms with a comparison of counts already reported in related species. These data were found to indicate that, in nature, genic mutation and inter- and intraspecific hybridization have been more important processes than chromosome doubling. The findings failed to support the theory that polyploids are usually harder than diploids and are therefore better adapted to climatically unfavorable regions.

Polyploidy in relation to chemical analysis, W. J. BONISTEEL (*Jour. Amer. Pharm. Assoc.*, 29 (1940), No. 9, pp. 404-408, figs. 8).—The author calls attention, with many examples, to the function that polyploidy exerts in the chemical constituents of drug plants, a field hitherto largely overlooked. For example, in the genus *Aconitum* toxicity of the plants varies with the chromosome number. Diploids are usually nontoxic, whereas the triploids and tetraploids represent the extremely toxic alkaloids of the genus. Hexaploids are considered nontoxic, and no definite information is available regarding the octoploids. Chemical analysis of *Cinchona* hybrids indicates that a shift from one alkaloid to another may take place in hybridization. The point is stressed that all studies on drug plants should include the cytological problems involved.

Failure of cytokinesis during microsporogenesis in *Zea mays* following heat treatment, G. A. LEBEDEFF. (Cornell Univ.). (*Cytologia*, 10 (1940), No. 4, pp. 434-442, figs. 26).—Failure of cytokinesis in the anthers of corn during premeiotic and meiotic divisions had no evident effect on the course of the nuclear division. Microsporocytes in which the cytoplasm failed to divide developed into multinucleate spores. The size of these spores was roughly proportional to the number of nuclei present.

A study of the inheritance of susceptibility and resistance to apple cedar rust, R. C. MOORE. (Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 242-244).—Analysis of 1-yr. records indicated that the factor for resistance or susceptibility is inherited and that there is a segregation of the progenies of crosses into resistant and susceptible types. It appeared that resistance might be dominant over susceptibility. Arkansas Black seemed to behave as a homozygous dominant for resistance, whereas Jonathan and Rome Beauty appeared to be homozygous recessives in their susceptibility. Of the other parent varieties involved in the crosses, Delicious, Ralls Seedling, Winesap,

and Virginia Beauty, even though they are phenotypically resistant, appeared to be heterozygous in resistance or susceptibility to rust. Inheritance of resistance appeared to involve only one genetic factor, although the available data were not large enough to establish it definitely. The degree of susceptibility of parent varieties appeared to manifest itself in the respective progenies.

Some aspects of selection of Merino stock for wool-production under pastoral conditions, J. E. NICHOLS (*Empire Jour. Expt. Agr.*, 8 (1940), No. 29, pp. 34-38).—A fairly steady annual increase in fleece weights with some irregularities in Merino sheep of New South Wales was effected from 1879 to 1934. Marked differences in the production in different regions were attributed to varying effects of environment. The important problem for improvement seems to be selection by progeny performance in the less favorable areas, thus basing selection on adaptation to specific local conditions.

Influence of inbreeding and other factors on litter size in Chester White swine, H. O. HETZER, W. V. LAMBERT, and J. H. ZELLER (*U. S. Dept. Agr. Cir.* 570 (1940), pp. 11, figs. 2).—The records of 362 litters of Chester Whites born over a 17-yr. period with variable degrees of inbreeding showed a downward tendency for litter size at birth, at 28 days, and at 70 days. Although the litter size decreased with inbreeding of the litter, size of the litter increased with age of the dam to about 3.5 years. About 10.7 percent of the variance in the number of pigs at birth, 4.9 percent in the pigs at 28 days, and 6 percent in the variance of the number of pigs weaned was associated with age of the dam. About 60 percent of the variance in litter size was due to causes which could not be determined. Less than 20 percent of the variance at any one age was hereditary. Season of birth, yearly changes in feeding and management, and differences in age of the dam appeared to account for the remaining 20 percent of the variance.

An albino buffalo (*Jour. Hered.*, 31 (1940), No. 8, p. 341).—Notation is made of an albino buffalo herd of 200 head in Alaska.

Albinism in the opossum, D. M. SMITH (*Jour. Hered.*, 31 (1940), No. 8, p. 342, fig. 1).—An albino opossum captured in Oklahoma is described.

Genetic studies on a cavy species cross—*Cavia rufescens* (Lund) and *Cavia porcellus* (Linné), G. v. UBISCH and R. F. MELLO (*Jour. Hered.*, 31 (1940), No. 9, pp. 389-398, figs. 5).—Comparative growth curves up to about 1 yr of age are presented for wild cavies of Brazil (pre δ), domestic cavies, and reciprocal F $_1$ and backcross progeny between them. Natural breeding and artificial insemination were employed to produce some of the crosses. The duration of gestation averaged 67.2 days for tame cavies and from 62 to 65 days for *C. rufescens* and hybrids between the species. An equal distribution of the sexes was found in the purebreds and crosses. Notation was made of the morphology of the skulls and semitransparent spots in the frontal bones of the wild species and hybrids.

A new mutation in the mouse—affecting spinal column and urogenital system, L. C. DUNN, S. GLUECKSOHN-SCHOENHEIMER, and V. BRAYSON (*Jour. Hered.*, 31 (1940), No. 8, pp. 343-348, figs. 4).—The dominant mutation in mice which causes short tail and a syndrome of abnormalities in the sacral region and is lethal in the homozygote (E. S. R., 78, p. 768) was found to segregate as a unit but does not affect viability before birth. Matings of short-tailed mice (heterozygotes) produced 159 normals, 368 short tails and tailless, and 153 lethals, essentially a 1:2:1 ratio when eliminating the progeny of one male. The genetic constitution of Bagg inbreds seemed to enhance the expression of the mutation in the heterozygote. The mutant *S δ* was not linked with the short tail gene *T* or caracul *Ca*. There was a heavy mortality after birth in the heterozygotes of 72 percent up to 30 days of age.

Change of the age of puberty in albino rats by selective mating, C. P. STONE and R. G. BARKER (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 48-50, fig. 1).—By 6 generations of selection for early and late breeding from 25 pairs of albino rats, strains were produced in which the average age of puberty of ♂s was 47.56 and of ♀s 42.98 days in the early strain, as contrasted with 61.18 in ♂s and 56.87 days in ♀s in the late line. These results suggest that the change in the age of puberty of rats during the last 30 yr. was probably a matter of selection.

[Genetic studies with poultry by the Indiana Station], E. E. SCHNEITZER (*Indiana Sta. Rpt.* 1939, pp. 101, 102, 103, 104, figs. 3).—Strains of hens markedly different in size and egg weights were produced by six generations of selection, and strains of turkeys were found to differ widely in their body weights. Differences in skeletal measurements were not proportionate to body size.

Breeding for egg weight and related characters, M. W. OLSEN and C. W. KNOX. (U. S. D. A.). (*Poultry Sci.*, 19 (1940), No. 4, pp. 254-257).—By selection over a 5-yr. period in Single-Comb White Leghorns, the egg weights showed a progressive increase from an average of 54.7 to 59.7 gm., with the body weights of the birds increasing progressively from about 4 to 4.6 lb. During this period the average age at maturity was decreased. An analysis of the contribution of the sire and dam and of their ancestors indicated the closest association of egg weight in the progeny and the egg weight of the sires' sisters.

A record-breaking "freemartin" (*Jour. Hered.*, 31 (1940), No. 9, p. 398).—Notation is made of a cow born twin with a bull which produced five calves.

Sperm stimulation in the bull through the subcutaneous administration of ascorbic acid, P. H. PHILLIPS, H. A. LARDY, E. E. HEIZER, and I. W. RUPEL. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 9, pp. 873-878).—The subcutaneous administration of ascorbic acid to bulls of relatively low potency resulted in increases in the ascorbic acid content of semen from values below 2 mg. per 100 cc. to 6 mg. or more. However, excessive amounts of ascorbic acid in the semen were often associated with an unreliable breeding record. Ascorbic acid was vitally concerned with the physiology of reproduction in bulls, but the exact nature of its role in this capacity was not known.

The effect of route of administration on the multiple activities of testosterone and methyl testosterone in different species, C. W. EMMENS and A. S. PARKES (*Jour. Endocrinol.*, 1 (1939), No. 3, pp. 323-331, fig. 1).—Investigation of the androgenic and gynecogenic activities of testosterone and methyl testosterone administered to capons, rats, and rabbits by inunction, orally, and parenterally showed testosterone to be much less active by mouth in capons and castrated ♂ rats than by subcutaneous injection. Progestational proliferation in rabbits was as actively produced by methyl testosterone by mouth as by injection. The two substances were about equally active in causing uterine growth in spayed rats and immature rabbits, whereas methyl testosterone was more potent as an androgen in rats but less potent in capons.

Relaxation of the pelvic ligaments of the guinea pig induced by progesterone, H. O. HATFIELD and N. W. FUGO (*Soc. Expt. Biol. and Med. Proc.*, 42 (1939), No. 1, pp. 155-157).—The administration of progesterone following oestrogen stimulation to ovariectomized ♀s was effective in inducing relaxation of the pelvic ligaments. A separate hormone for the action of relaxin was not necessary (*E. S. R.*, 65, p. 428).

Failure of ovarian hormones to cause mating reactions in spayed guinea pigs with hypothalamic lesions, J. M. BROOKHART, F. L. DEY, and S. W. RANSON (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 61-64).—Since ♀ guinea pigs with hypothalamic lesions failed to mate, although most of them showed normal sexual cycles, a series of 27 young adult ♀ animals were ovariec-

tomized and brought into regular oestrus by oestrone and progesterone administration. After lesions were made in the hypothalamus, treatment with ovarian hormones did not induce oestrus or pro-oestrus. None of the animals would mate. However, slight changes in the location of the injury permitted normal oestrous cycles.

Ovarian transplantations in the house mouse, G. G. ROBERTSON (*Soc. Exptl. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 302-304).—Four agouti ♀s, each carrying one ovary from a yellow litter mate and none of its own, produced nine yellow and nine agouti progeny after matings with agouti ♂s. Second litters of eight yellow and three agouti offspring were produced by mating with yellow ♂s. The yellows were heterozygous, and failure to produce young when the grafts were not successful showed the completeness of the removal of the ovaries in these cases. The findings bear out previous findings of Castle and Phillips with guinea pigs (*E. S. R.*, 30, p. 472). Transplantations between different inbred lines were unsuccessful.

The production of ovulation in the rabbit by the intravenous injection of salts of copper and cadmium, C. W. EMMENS (*Jour. Endocrinol.*, 2 (1940), No. 1, pp. 63-69).—Adult does of the heavy breeds were injected intravenously with doses of copper acetate, sulfate, and analine and of cadmium acetate and chloride, which produced ovulation in approximately 15 to 17 hr., as determined by laparotomy. Various salts of barium, cobalt, gold, iron, manganese, nickel, silver, and zinc were ineffective. Ovulation was inhibited by the simultaneous administration of an antiserum produced by rabbits after daily injection with 25 mg. of a pyridine of acetone-desiccated ox pituitary.

Superovulation in rabbits, G. PINCUS (*Anat. Rec.*, 77 (1940), No. 1, pp. 1-8).—Pregnant-mare-serum extracts intravenously administered to prepubertal and pubertal rabbits following priming caused ovulation, but rarely superovulation because of a tendency to induce cyst formation. Pituitary extracts under similar conditions usually produced superovulation. There were induced with an unfractionated extract over 80 ova in 3 different litters. Mating did not influence the number of ova but showed that they were fertilizable. Mating could not be substituted for the ovulating dose.

The uterus masculinus of the rabbit and its reactions to androgens and oestrogens, R. DEANESLY (*Jour. Endocrinol.*, 1 (1939), No. 3, pp. 300-306, pl. 1).—The administration of oestrogen to adult castrated and immature ♂ rabbits was found to stimulate the growth and development of the uterus masculinus in spite of the fact that the epithelium underwent shrinkage unless some form of testosterone was also administered.

Effects of oestrogen and androgen injections on reproductive organs in male rats and mice, R. HARSH, M. D. OVERHOLSER, and L. J. WELLS. (*Univ. Mo.*). (*Jour. Endocrinol.*, 1 (1939), No. 3, pp. 261-267, pl. 1).—Metaplastic changes in the epithelium of various reproductive organs and penis extrusion of immature and adult ♂ rats and mice resulted from the administration of oestrogen. In the joint administration of oestrogen with testosterone, metaplasia in the prostates was prevented, but the androgen did not prevent all the effects of oestrogen since there was bladder dilatation, penis extrusion, and metaplastic change in the seminal vesicle ducts.

The liver and endogenous androgens, M. W. BURRELL and R. R. GREENE (*Soc. Exptl. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 273-276).—Since subcutaneous implantations of testicular tissue into immature rats showed some androgenic effects on the penis and accessories but such effects were not shown when the implants were placed so that there would be venous drainage through the liver, it is concluded that the testicular androgen is inactivated in the liver.

Effect of small doses of testosterone propionate on the testis, H. S. RUBINSTEIN and A. A. KURLAND (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 168, 169).—Androgenic potency of testosterone propionate was demonstrated by significant enlargement of the seminal vesicles of rats injected with 10 γ of testosterone propionate daily for 10 days. The rats were 22 days old at the beginning of the experiment.

Effect of thymectomy at birth on spermatogenesis in the albino rat, J. C. PLAGGE (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 1, pp. 57-60).—Thymectomy of δ rats at birth was found at autopsy at from 33 to 38 days of age to neither retard nor hasten spermatogenesis, hormone production, or testis growth, as compared with the controls.

Inadequacy of the vaginal smear in the rat as an index of ovarian dysfunction caused by diet, S. C. FREED, O. HECHTER, and S. SOSKIN (*Jour. Endocrinol.*, 1 (1939), No. 3, pp. 268-274).—Examination by laparotomy of the uterine response observed during vaginal oestrus of \varnothing rats on different diets showed that the completeness of the cycle was significantly affected by a low-protein diet plus 4 percent of ammonium chloride, whereas a relatively complete uterine oestrus was produced on a diet to which 8 percent of baking soda was added. The ovaries of rats with incomplete uterine oestrus seemed normal in size and mature follicles were few or absent after 4 weeks on the experimental diets. As a control to show that the rats on these diets did not lose the capacity to show complete uterine response, \varnothing s exhibiting only partial oestrus were castrated and found to show complete oestrus following the administration of oestradiol benzoate. These results led to the conclusion that the ovaries damaged by the diets failed to secrete one or more of the oestrogenic factors the composition of which was necessary for complete oestrous reaction. Vaginal oestrus was not necessarily an indication of complete oestrus.

Influence of age of animal and nature of injected hormone preparation on antihormone production, A. S. GORDON, I. LEVYSTEIN, and H. A. CHARPPIER (*Soc. Expt. Biol. and Med. Proc.*, 42 (1939), No. 1, pp. 121-126).—The antigonadotropic hormone production of immature and adult \varnothing rats injected daily with Follutein (human pregnancy-urine extract) and Gonadin (pregnant-mare serum) for from 35 to 95 days was compared by injection of immature \varnothing s simultaneously but at different sites with one of the hormones and the antihormone from the treated animals. Both mature follicles and corpora lutea were seen in the test animals after 5 days' treatment. The analysis of the results, as determined by the inhibition of increased ovarian weights, showed that adult rats produced more antihormone in response to injections of anterior-pituitary-like preparations than immature \varnothing s. Follutein evoked the production of more antihormone than Gonadin.

Method of assay for progesterone based on the inhibition of uterine oestrus, A. J. SZARKA (*Jour. Endocrinol.*, 2 (1940), No. 1, pp. 1-11, figs. 2).—Study was made of the fluid distension of the uterus of ovariectomized adult and intact immature \varnothing rats following oestrone administration and the inhibition of this effect resulting from progesterone. In the tests from 1.2 to 1.5 mg. of crystalline progesterone completely inhibited the usual response of the uterus to the administration of 48 μ g. of oestrone. The potency of the progesterone substance to be tested was determined on a regression line based on the degree of inhibition of uterine oestrus. Laparotomy was performed on the experimental animals 44 hr. after the simultaneous administration of oestrone and progesterone, and the uterine condition was recorded. The test was accurate within \pm 20 percent, using from 18 to 20 test animals with each dose.

On the mechanism of the action of gonadotrophin from pregnancy urine, B. ZONDEK (*Jour. Endocrinol.*, 2 (1940), No. 1, pp. 12-20).—Chorionic gonadotropin administered to immature ♂ rats was rapidly inactivated so that only 5 percent could be recovered in 30 hr. from maceration of the whole animal. Inactivation of oestrogen was effected in the liver, but chorionic gonadotropin was not inactivated following shaking and incubation with macerated liver, spleen, and muscle. Chorionic gonadotropin in its original form and not after transformation into a "hormonoid" acts on the ovarian cell.

Modification of the effectiveness of gonadotrophic extracts, R. DEANSLY (*Jour. Endocrinol.*, 1 (1939), No. 3, pp. 307-322).—The addition of 15 mg. of zinc sulfate to extracts of pig, sheep, and ox pituitaries and administration to immature ♀ rats in divided doses on 5 days augmented the ovarian weights to nearly double those obtained with pituitary extracts alone. Extracts of horse pituitary produced much larger ovaries, but they were not augmented further by the zinc salts. Extracts of pregnant-mare serum and pregnancy-urine extract were not augmented in their effectiveness on ovarian weights by the addition of zinc given on 5 days. Combinations of gonadotropic extracts from different sources in relation to synergistic and antagonistic effects gave variable and somewhat contradictory results.

Effect of heterologous antigonadotropic sera on the course of pregnancy in rats, B. ZONDEK, A. HOCHMAN, and F. SULMAN (*Soc. Expt. Biol. and Med. Proc.*, 42 (1939), No. 1, pp. 338-341).—The species specificity of antigonadotropic hormones was brought out in a large number of negative results obtained when the hormones inhibiting the action of antigonadotropic sera from one species did not show a similar effect to that from others. Antigonadotropic sera from goats immunized to human prolactin and prosylan did not interfere in the rat with the normal cycle nor with impregnation, nidation, delivery, and normal breeding.

Further evidence for a mammogenic factor in the rat hypophysis, R. P. REECE and S. L. LEONARD. (N. J. Expt. Stas.). (*Soc. Expt. Biol. and Med. Proc.*, 42 (1939), No. 1, pp. 200-202).—Castrated sexually immature ♀ rats which received no further treatment and served as controls had mammary glands that were involuted, with a naked duct system. Such rats receiving pituitary implants from adult ♂s and ♀s showed numerous and enlarged end buds in the mammary glands at autopsy 12 days later. The mammary glands of rats receiving pituitaries from ♂s and ♀s previously treated for 10 days were not significantly different from the mammary glands of castrated and hypophysectomized ♀s which received implants of pituitaries from oestrogen-treated ♂s and ♀s. However, the latter group made little gain in body weight. Thus the presence of a hypophyseal factor inducing growth of the mammary glands in hypophysectomized castrated immature ♀ rats was demonstrated, in support of the findings of Lewis, Turner, and Gomez (*E. S. R.*, 82, p. 322).

The influence of oestradiol on the social organization of flocks of hens, W. C. ALLEE and N. COLLIAS (*Endocrinology*, 27 (1940), No. 1, pp. 87-94, fig. 1).—The birds in five flocks of White Leghorns were intramuscularly injected daily with oestradiol for periods up to 68 days. Few changes in the social aggressiveness and flock organization were evident from peck tests in contradiction to the effects of testosterone (*E. S. R.*, 82, p. 614).

The effects of oestrone and testosterone and of pituitary extracts on the gonads of hypophysectomized pigeons, J. P. CHU (*Jour. Endocrinol.*, 2 (1940), No. 1, pp. 21-37).—Studies of the effect of hypophysectomy and various pituitary extracts and sex hormones on the reproductive organs of normal and hypophysectomized pigeons showed that both the testes and ovaries undergo

statistically significant involution, but the ovarian weights do not show as great difference between the normal and operated birds as that found in the testes. Regression in the weights of the adrenals and the pancreas was also noted, with little change in the thyroid within 14 days. No mature sperm were seen in birds from 15 to 20 days after hypophysectomy. The ovaries were atrophied and showed absence of follicular proliferation. Ox, sheep, and horse pituitary extracts had a pronounced effect, although not complete, on the prevention of loss in weight of the organs when given before regression. When given after regression these extracts considerably stimulated the ovaries, and the oviduct was large and vascularized. Full spermatogenesis was induced by extracts of horse pituitaries, but loss in body weight and weights of other endocrine organs was not checked. Testosterone administered to normal ♂s had no effect on the endocrines, in general, but the testes regressed as in hypophysectomized birds. Testosterone showed a stimulating effect on the gonads of both sexes following hypophysectomy. Oestrone was not effective in maintaining testicular or ovarian activity under such conditions.

Further studies on the relation of the daily exposure to light to the sexual activation of the male starling (*Sturnus vulgaris*), J. W. BURGER (*Jour. Expt. Zool.*, 84 (1940), No. 3, pp. 351-361, pl. 1).—Continuing these studies (E. S. R., 81, p. 195), the author attempted to determine the precise conditions of sexual activation of the sexually inactive ♂ starling. Two groups were exposed to 12.5 and 13.5 hr., respectively, of light daily in a dark room to find the minimum stimulating day lengths. All birds receiving 13.5 hr. showed sperm in the testes by February 12. Sexual stimulation was not uniformly complete in the birds exposed to 12.5 hr. of lighting, and therefore this exposure was fairly close to the threshold. In some birds, activation was complete.

FIELD CROPS

[Agronomic research in the Southern States] (*Assoc. South. Agr. Workers Proc.*, 41 (1940), pp. 53, 54, 63, 65-70, 71, 72, 74-88, 141-149, 184, 185, 188, 190, 191, 195, 196).—Papers concerned with agronomic problems and presented at the convention of the Association of Southern Agricultural Workers at Birmingham, Ala., February 7-9, 1940, reported in abstract form, included Equipment for Experimental Work in Curing Tobacco, by L. S. O'Bannon (pp. 53, 54), and The Place and Value of Liming in Kentucky, by P. E. Karraker (pp. 74, 75) (both Ky. Expt. Sta.); Legume Coverage Studies in Alabama, by I. F. Reed (p. 63), The Nitrogen, Organic Carbon, and pH of Some Southeastern Coastal Plain Soils as Influenced by Green-Manure Crops, by R. D. Lewis and J. H. Hunter (pp. 68, 69), A Complete Balanced Vegetative Program for Soil Conservation, by R. Y. Bailey (pp. 69, 70), Soil Organic Matter and Nitrogen as Influenced by Green Manure Crop Management on Norfolk Coarse Sand, by N. McKaig, Jr., W. A. Carns, and A. B. Bowen (p. 70), The Effects of Calcium and Magnesium on the Physical Properties of Some Lateritic Soils, by T. C. Peele (p. 77), Adaptation of Several *Trifolium* Species to Different Ecological Environment in the South, by E. A. Hollowell (pp. 82, 83), Use of Hormone Treated Cuttings and Special Type Grafts in Cotton Breeding, by W. H. Jenkins, D. C. Harrell, and J. O. Ware (p. 188), and Storage Tests With Cotton Seed, by D. M. Simpson (pp. 195, 196) (all U. S. D. A.); Returns From the Use of Fertilizers on Southern Crops, by H. R. Smalley (pp. 65, 66); The Elimination of Differences in Investment in the Evaluation of Fertilizer Analyses, by W. B. Andrews (p. 66), Variations in Johnson and Dallis Grass, by H. W. Bennett (pp. 85, 86), and Some Water Relations in Sweetpotato, by W. S.

Anderson (pp. 147, 148) (all Miss. State Col.); Selection of Effective Strains of Legume Bacteria for Leguminous Plants in the South, by L. W. Erdman and J. C. Burton (pp. 66, 67); Time and Rate of Plant Nutrient Absorption by Bright Tobacco, by A. L. Grizzard and H. R. Davies (pp. 67, 68), and Selecting a Microchemical Method of Soil Testing for Use in Virginia, by A. L. Grizzard (pp. 80, 81) (both Va. Sta.); Suitable Crop Patterns for Changing Conditions in Southern Agriculture, by T. B. Hutcheson (pp. 71, 72) (Va. A. and M. Col.); The Effect of Liming on the Absorption of Phosphorus and Nitrogen by Winter Legumes, by C. A. Brewer, Jr., and F. L. Davis (p. 74), The Effects of Wetting, Drying, and Treatments on the Availability of Potassium in Soils, by R. K. Walker and M. B. Sturgis (p. 79), and Effect of Certain Methods of Treating and Planting Cotton Seed in South Louisiana, by H. B. Brown (p. 184) (all La. Sta.); Properties of Calcic, Magnesic, and Dolomitic Materials and Their Divergent Behavior in Soils, by W. H. MacIntire (p. 76) (Univ. Tenn.); The Use of Lime in Balancing Our Southern Agriculture, by H. P. Cooper (pp. 76, 77), Experiments With Electricity in Sweetpotato Plant Production, by J. B. Edmond and G. H. Dunkelberg (pp. 146, 147), and The Influence of Height of Bed on Yield and Shape of Sweet Potatoes, by O. B. Garrison (pp. 148, 149) (all S. C. Sta.); Field Variation as a Factor in Sampling for Rapid Soil Analyses, by E. R. Collins and W. R. Hodgen (pp. 77, 78), and Winter Survival and Yield of Rough and Smooth Awned Segregates in Fall-Sown Barley, by G. K. Middleton and W. H. Chapman (p. 86) (both N. C. Sta.); Rapid Chemical Tests in Georgia (pp. 79, 80), and Chemical and Physical Studies on Soils From the Regional Cotton Wilt Plots (pp. 190, 191), both by L. C. Olson, and Permanent Pastures for the Piedmont Section of Georgia, by O. E. Sell (pp. 86, 87) (all Ga. Sta.); A Comparison of Field Crop Response and the Amount of Phosphorus Removed From Alabama Soils by Chemical and Biological Methods, by G. W. Volk (p. 81), Certain Aspects of Southern Seed Potato Trials, by H. M. Darling (pp. 141, 142), and Recent Results of Research Work on the Culture of Irish Potatoes in the South, by L. M. Ware (pp. 144-146) (all Ala. Sta.); Adaptation of Winter and Summer Legumes in the South, by G. E. Ritchey (pp. 81, 82) (Fla. Sta. and U. S. D. A.); Environmental Factors as Related to Growing Winter Pasture Plants in Florida, by R. E. Blaser (p. 83) (Fla. Sta.); Breeding for Adaptation in Red Clover, by L. Henson (p. 84) (Ky. Sta. and U. S. D. A.); Breeding Forage Grasses for Adaptation to Southern Conditions, by G. W. Burton (pp. 84, 85) (Ga. Coastal Plain Sta. and U. S. D. A.); Grass in Southern Agriculture, by L. R. Neel (pp. 87, 88) (Tenn. Sta.); Recent Refinements in Field Plot Technique in Relation to Irish Potatoes, by H. L. McClerg (p. 141) (U. S. D. A. and La. Sta.); Technic and Methods of Breeding Irish Potatoes in the South, by J. C. Miller (pp. 142, 143) (La. State Univ.); Recent Results of Potato Fertilization Research in the South, by H. H. Zimmerley (pp. 143, 144) (Va. Truck Sta.); and Field Results With Gravity Graded Cotton Seed, by K. S. Chester (p. 185) (Okla. A. and M. Col.).

[Crop research in Indiana], R. R. MULVEY, G. P. WALKER, A. T. WIANCKO, G. D. SCARSETH, M. DRAKE, W. W. WORZELLA, G. H. CUTLER, C. E. SKIVER, S. R. MILES, A. M. BRUNSON, F. C. GAYLORD, and J. D. HARTMAN. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt. 1939*, pp. 11, 13-15, 45-50, 60, 61, 99, 111-115, figs. 2).—Progress results are reported from investigations (E. S. R., 81, p. 688) including breeding work with corn and hybrids, wheat, oats, and soybeans; variety tests with corn varieties and hybrids, sunflowers for silage, and sweetpotatoes; comparison of alfalfa, red clover, and sweetclover as hay crops; mixed seedings of legumes and timothy v. straight clover for the hay crop in the rotation; rotation with wheat after soybeans v. wheat after corn; value

of inoculating soybeans, rate of seeding winter barley; effects of clipping of oats; protection of seed grain from weevil damage by treatment with mercury dust; corn production from late plantings; factors affecting winter hardiness and quality in soft red winter wheat; effects of fertilizer applications, other practices, and leaf rust on yield and quality of winter wheat; increase of potash losses from lawns and golf greens caused by heavy applications of ammonium sulfate; ability of plants to absorb native potash from the soil; magnesium deficiency in soils especially induced by high rates of potash fertilization; plowing under heavy applications of cyanamide for corn; effects of various plant foods upon the wheat plant; effects of green manures on the growth of sweetpotatoes; soil fertility studies involving response of corn, wheat, soybeans, and clover in rotations to fertilizers, lime, and manure; effects of different methods of disposing of cornstalks on soil fertility; a comparison of red clover, alfalfa, and sweetclover in rotations with corn and wheat; a study with a 4-yr. rotation of corn, corn, soybeans, and potatoes to find the need of well-disintegrated deep muck of the nonacid type for lime, phosphorus, and potassium; and experimentation on Crosby silty clay loam to determine effects of lime, manure, and commercial fertilizers on yields of corn, wheat, and mixed hay and on soil fertility.

Depth of plowing and crop yields, A. N. HUME (*South Dakota Sta. Bul. 344* (1940), pp. 23, figs. 4).—Effects of plowing at differential (4- to 12-in.) depths before planting corn in the 4-yr. rotation corn, winter wheat, oats, and legumes, 1913-37, are presented. Corn increased in total weight as well as bushels per acre directly with deeper plowing to the maximum of 12 in., but it was the only crop showing this trend in total weight. Yields of grain from winter wheat and oats, as well as corn, increased in general with increased depth of plowing for corn. No relation was established between the total weight of legume (clover, sweetclover, or soybeans) seed and hay or seed alone and depth of plowing. Subsoiling did not appear to result in an increase in yields.

Soil conditions in relation to the response from green manure applications, H. J. HAEPER (Okla. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 266-270).—Green manure studies indicated that the nitrogen content of three soil types in central Oklahoma is still adequate for production of maximum yields of cotton under the climatic conditions. The nitrogen content of a Kirkland very fine sandy loam declined from 0.077 percent in 1926 to 0.043 in 1939, and during this period cotton yields were not increased when fall-planted hairy vetch or Austrian Winter peas were plowed under each spring about 3 weeks before cotton planting. Profitable increase in cotton yields evidently will not be obtained on most soils under average climatic conditions in the section when soil nitrogen exceeds 0.05 percent. Increases in wheat yields, it appeared, may be obtained at a higher fertility level than cotton when the cropping system includes a legume.

Calcium in relation to phosphorus utilization by some legumes and nonlegumes, W. A. ALBRECHT and N. C. SMITH. (Mo. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 260-265, figs. 8).—The forage production by red-top, bluegrass, Korean lespedeza (E. S. R., 81, p. 642), and sweetclover pointed to an importance of calcium in the use of phosphorus by these crops. More of the applied phosphorus was recovered in the crop as the degree of saturation of the soil by calcium became greater, more largely because of greater crop yields than because of higher concentration of phosphorus in the forage. Increasing applied phosphorus also served to increase the calcium taken from a constant soil supply and suggested a reciprocal effect by phosphorus on

calcium. Saturation of one-fourth of the soil by calcium increased the phosphorus harvest by 36 percent, while the corresponding increase was only 10 percent when the same total calcium supply served to increase the amount of lime in the entire soil by only one-fourth of that necessary for saturation. When phosphorus was applied with limestone this same effect by lime was evident. Thus liming becomes a matter of feeding calcium to the plant effectively and of aiding it in getting its phosphorus rather than one of modifying H-ion concentration. Degree of saturation of a limited soil area appeared more significant in controlling the efficiency of the calcium recovery by the crop than did the total calcium application throughout the soil. This calcium recovery is also influenced by increased phosphorus in the soil. The total harvest of protein also increased when increased calcium and phosphorus harvests occurred. Increases in calcium utilization by the grasses as redbud, for example, served to lower the silicon concentration and also that of aluminum and iron.

Deterioration of midwestern ranges, J. E. WEAVER and F. W. ALBERTSON. (Univ. Nebr. and Kans. State Col.). (*Ecology*, 21 (1940), No. 2, pp. 216-236, figs. 27).—A survey in the summer of 1939 of 88 ranges representative of grazing lands in western Kansas and Nebraska, southwestern South Dakota, eastern Wyoming and Colorado, and the Oklahoma Panhandle showed that severe drought, overgrazing, burial by dust, and grasshopper damage resulted in great reduction of the cover of range grasses. This portion of the mixed prairie has almost completely lost its upper story of midgrasses on nonsandy lands. Short grasses and sedges have undergone a process of thinning so that only the most vigorous plants remain alive. Many less xeric forbs have practically disappeared, and only six or eight of the most xeric native forbs are regularly represented by much dwarfed and widely spaced individuals. The basal cover of grasses was 21 percent or more in only 16 percent of the ranges; in another 16 percent it ranged between 11 and 20 percent; between 6 and 10 percent in 28 percent; from 2 to 5 percent in another group totaling 16 percent; and the remaining 24 percent presented a cover of 1 percent or less. Extremely poor conditions varied with the better ones throughout. The bare soil during periods with moisture is populated with annual weeds, chief of which is Russian thistle. Cacti have increased greatly almost everywhere and constitute a serious problem. Because of the low precipitation of 1939, most ranges lost any gains made during favorable periods since 1934.

Cereal crops at the Dickinson Substation, R. W. SMITH. (Coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, 3 (1940), No. 1, pp. 15-21).—Variety tests, reported in tables showing annual and average yields over the past 10 yr., indicate as productive cereals Gopher, Logold, Markton, and Rainbow oats; Trebi, Steigum, Ezond, and Spartan barley; Gehu, Dakota White, and Shota flint, and Falconer semident corn; and Bison flax. Emmer yielded slightly less than the best oats on a comparable basis. Flaxseed yields averaged highest from May 1 and April 20 seedings, with progressive decreases from plantings after May 1.

Soil conditions under which alfalfa responded to boron, B. A. BROWN and A. KING. ([Conn.] Storrs Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 310-313).—Boron deficiency in alfalfa appeared on station plats and on Connecticut farms during the dry summer of 1939. Borax at 20 lb. per acre at time of seeding alfalfa in August 1938 reduced the average prevalence of "yellows" in August 1939 from 25 to 3 percent, increased height by 15 percent, yields by 16 percent, and the boron in the alfalfa leaves from 21 to 62 p. p. m. Manure did not obviate the symptoms significantly but apparently increased the available boron in the soil slightly and the total boron in alfalfa leaves appre-

ciably. More affected plants appeared on heavily limed nonboron plats but fewer where potassium chloride had been applied heavily between 1915 and 1923. Alfalfa did not benefit from adding manganese, copper, or zinc to potash-borax or potash-superphosphate-borax treatments.

Differential growth rates in cotton varieties and their response to seasonal conditions at Greenville, Tex., H. C. McNAMARA, D. R. HOOTON, and D. D. PORTER (*U. S. Dept. Agr., Tech. Bul. 710 (1940), pp. 44, pls. 6, figs. 8*).—Rates of growth and fruiting in six upland cotton varieties, Acala, Lone Star, Rowden, Delfos, Half and Half, and Kekchi, which have widely contrasted characters, were studied, 1931-33. In Lone Star, Kekchi, and Half and Half the number of nodes to first fruiting-branch was influenced significantly by season. The interval in days between appearance of first flowers on successive fruiting-branches was strongly influenced by season, and in one case by variety. The intervals between successive flowers on fruiting branches usually were shortest on branches from the eleventh to the fifteenth nodes, the points of maximum fruiting-branch development, and were longer on the first two fruiting branches as well as the uppermost branches, and were influenced significantly by variety and season. An average of 56 percent of all bolls matured on all varieties were located on the first fruiting-branch nodes. Lone Star was lowest in this respect, with 51.31 percent, and Delfos was high, with 58.97 percent. The second fruiting-branch nodes produced about one-half as many bolls as the first and the third node about one-half as many as the second node. Chances of setting bolls evidently were reduced 50 percent with each successive fruiting-branch node. The varieties that produced the most flowers also matured the largest number of bolls. The medium- to large-bolled varieties matured bolls from 26 to 28 percent of their flowers, and the small-bolled varieties, Delfos and Half and Half, set 39.1 and 42 percent, respectively.

About three-fourths of the total crop of bolls was set within 4 weeks after the first flowers appeared. Delfos set 92 percent of its crop within 4 weeks of the first flower. The boll-shed period was rather uniform, averaging 5.16 days for all varieties. In cotton, plants fruit or defruit (as when demand for water becomes acute in drought) in successive zones, which are described as the fruiting, small-boll shedding, and small-square shedding zones. Each zone extends upward and outward from the base of the plant. Branches on which the most bolls were set showed terminal abortion the oftenest. The mean boll period for all varieties was 43.93 days, and like the boll-shed period might be influenced significantly by variety and season. The boll period on upper and outer fruiting positions usually exceeded those on inner and lower positions. Thickness of carpels in relation to boll period also is discussed.

Pectic substance of cotton fibers in relation to growth, R. L. WHISTLER, A. R. MARTIN, and C. M. CONRAD. (Coop. U. S. D. A.). (*Jour. Res. Natl. Bur. Standards [U. S.], 25 (1940), No. 3, pp. 305-308, fig. 1*).—Determination of the content of pectic substance in fibers of Mexican Big Boll (grown at Raleigh, N. C.) at various stages of growth suggested three distinct stages of development of the fiber. The first, extending to about the eighteenth day, is characterized by a gradual decrease in the content of pectic substance. During the second, which extends from the eighteenth to about the thirty-fifth day, there occurs a rapid decrease in pectic substance. In the final stage, from about the thirty-fifth day to maturity, only a slight decrease is noted in the content of pectic substance.

Potato varieties recently distributed to growers in the United States, F. J. STEVENSON. (U. S. D. A.). (*Amer. Potato Jour., 17 (1940), No. 9, pp. 217-225*).—Adaptations and performances are summarized from information provided by experiment stations from their tests and studies of the Chippewa,

Earlaine, Houma, Katahdin, Mesaba, Nittany Cobbler, Pennigan, Pontiac, Red Warba, Sebago, Sequoia, and Warba potato varieties.

Recent studies on fertilizer applications for Gold Skin sweet potatoes, V. A. TIEDJENS and L. G. SCHERMERHORN. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 857-859).—The fertilizer was applied in different types of band placement, all or in part after setting plants, in solution, and applied with the phosphorus separate from the nitrogen and potassium salts. The results, preliminary in nature, gave indications that any method of applying fertilizer which places it in close proximity to the roots when the plants are set is not conducive to good yields. Deferred applications of all or part of the fertilizer as side dressings materially increased yields. Using less than 100 lb. of fertilizer in solution produced higher yields than the standard treatment, 1,200 lb. of 2-8-10 under the row 2 weeks before setting plants. Placing only superphosphate, with or without lime under the rows, and adding nitrogen and potassium later produced the largest yield increases.

Potato rotation studies, O. SMITH and E. N. McCUBBIN. (Cornell Univ.). (*Amer. Potato Jour.*, 17 (1940), No. 9, pp. 235-243).—In Steuben and Franklin Counties, N. Y., highest yields of potatoes were obtained in rotations in which potatoes are grown every year and receive commercial fertilizer plus 12 tons of manure per acre. The highest-yielding 2-yr. rotation is potatoes following a 1-yr. sod of clover and timothy grown for green manure, and the lowest include potatoes following dry shell beans or soybeans for hay. In Genesee County yields among any of the rotations did not differ much in 1937 or 1938, while in 1939 the 2-yr. rotations, potatoes after corn for green manure and dry shell beans, respectively, did best. Potatoes in manured rotations in this county did not yield higher than in similar rotations omitting manure. Extremely low yields were obtained in Franklin County where potatoes were grown continuously without treatment, while in Genesee County such rotations yielded as well until 1939 as any others.

Arsenic compounds toxic to rice, E. A. EPPS and M. B. STURGIS. (La. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 215-218).—A study was made of the kinds of arsenic compounds that may be toxic to rice (R. S. R., 75, p. 772), as accumulated in the soil as a result of spraying or dusting for control of insect pests, and of means for correcting the toxicity. Some arsenic compounds in flooded soils are reduced, with consequent increase in soluble arsenic content of the soil and decrease in total arsenic content due to liberation of gaseous compounds of arsenic, e. g., as arsine. Many naturally occurring compounds of arsenic are not attacked by the micro-organisms and do not become more soluble. Sulfur added to soils containing toxic amounts of arsenic decreased the amount of soluble arsenic, as was shown by analysis, by improved crop growth, and by decreasing intake of arsenic by rice. The amount of soluble arsenic present in soil after waterlogging is an index of the degree of arsenic toxicity. When soluble arsenic determined by this means exceeds 0.2 p. p. m., arsenical injury may be expected.

[Papers at the twentieth annual meeting of the American Soybean Association] (*Amer. Soybean Assoc. Proc.*, 20 (1940), pp. [1]-84, figs. 9).—Papers presented at the meeting held from August 18-20, 1940, included General Review of the Domestic Soybean Situation, by E. F. Johnson (pp. 7-18); Soybean Oil—Its Current Consumption, by H. W. Galley (pp. 19, 20); Soybean Oil Meal—Its Current Consumption, by J. W. Hayward (pp. 21-23); Importance of Soybeans to American Agriculture (With Some Notes on Soybean Research), by W. L. Burlison (pp. 27-35) (Univ. Ill.); News From the Regional Soybean Laboratory, by R. T. Milner (pp. 36-38) (U. S. D. A. and 12 expt. stas.); What

the Implement Manufacturers Are Doing To Assist the Soybean Grower, by F. A. Wirt (pp. 40-52); Today's Trend in Soybean Production, by J. T. Smith (pp. 53-55); Performance of Early Soybean Varieties in Michigan, by C. R. Megee (pp. 56-58) (Mich. State Col.); The Rise of Edible Soybeans, by J. W. Lloyd (pp. 59-62) (Ill. Sta.); Possibilities of Soybean Milk, by E. A. Ruddiman (pp. 62, 63); The Role of the Soybean in Human Nutrition, by H. W. Miller (pp. 64-71); Soybeans Around the World, by W. J. Morse (pp. 72-74) (U. S. D. A.); Progress of the Soybean Industry in Ohio, by J. W. Bricker (pp. 75-77); and Full Soya in the Soldier's Diet, by H. Weiss (pp. 78, 79).

Crop sequence effects and the results with the sugar beet crop on the Merrill farm of the Lake Shore Sugar Company, Merrill, Mich., J. G. LILL (Coop. U. S. D. A. et al.). (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 1, pp. 29-32).—During the period 1933-39, with corn as the preceding crop on Brookston loam, sugar beets produced an average of 15,550 marketable roots and an acre yield of 10.295 tons of roots, after beans 14,982 and 10.122, barley 13,400 and 8.934, and after oats 13,325 roots and 8.679 tons. The respective indicated-available sugar production per acre was 2,753, 2,604, 2,340, and 2,292 lb. Acre yields of roots followed closely trends shown by numbers of marketable roots, and indicated-available sugar per acre followed very closely the root yield. The quality of the roots was in the decreasing order after corn, oats, barley, and after beans. Differences were definite but, in general, too slight to influence sugar production much. There were definite indications that crop sequence effects on sugar beets should be considered when a rotation including sugar beets is planned. Certain sequences can entail no important increase in cost of producing sugar beets or may even decrease costs.

Sugarcane, W. E. CROSS (*La caña de azúcar. Buenos Aires Univ., Bibliot. Agron. y Vet. [Pub.]* 2 (1939), pp. XVII+231, pls. 8, figs. 68).—Designed primarily for conditions in Argentina and based extensively on research at the Tucumán Experimental Station and elsewhere, this volume discusses the importance of science to the sugarcane industry, sugarcane and its chemical composition, climate and soils, varieties, cultural methods, diseases and insect pests, harvest, sugar yields, and production costs. A bibliography and index are appended.

Effect of various soil treatments on nitrates, soil moisture, and yield of winter wheat, A. F. BRACKEN. (Utah Expt. Sta.). (*Soil Sci.*, 50 (1940), No. 3, pp. 175-183).—The relationships of yield of winter wheat under dry-farm conditions to amounts of available nitrogen and of soil moisture as influenced by time of plowing and manurial treatments were studied at Nephi, Utah, 1923-33.

Delay in spring plowing for fallow was found to reduce significantly the yield of winter wheat, due to lower moisture supplies and reduced amounts of nitric nitrogen. Yields on soils treated with 5 or 10 tons of manure did not differ much, although they were 16 percent higher than on unmanured land, chiefly because of the greater amounts of nitric nitrogen. Most of the available nitrogen was used by the time wheat began to ripen, but a slight increase was noted later, although moisture supplies remained unchanged. On fallow land, accumulation of nitric nitrogen occurred in late summer and in early fall, even though soil moisture conditions were more favorable earlier. The available nitrogen found at the end of summer in fallow land was largely located the following spring, but at a slightly lower depth. Time of plowing did not influence protein percentage of the wheat, but definite increases resulted from manure. Loss of available nitrogen from the soil slightly exceeded that accounted for by removal of the crop. Water cost of dry matter decreased with earliness of plowing for fallow and with increased manure.

An experiment in pre-harvest sampling of wheat fields, A. J. KIRGE and E. H. JEBB. (Coop. U. S. D. A. et al.). (*Iowa Sta. Res. Bul.* 273 (1940), pp. 621-649).—Route sampling of the wheat crop to estimate and forecast yield per acre was shown in studies in 1938 in crop-reporting districts in eastern North Dakota to be a practical and an efficient method. Stratification by varieties would have resulted in a marked gain in accuracy; about 40 percent fewer fields would have been required to give the same precision. Geographical stratification, however, would have added little to the information in 1938. Variance between fields exceeded that within fields and gain in accuracy would be small with increased sampling per field. Sampling more fields would add more to the information. Regression analysis showed number of heads per sample to be the best indicator of yield, although the height of grain in the sample and average length of heads added some information. Yields determined from the objective sampling study exceeded very slightly current estimates by the U. S. Department of Agriculture.

A comparison of hard red winter and hard red spring wheats: An examination of pertinent opinions and data, R. K. LARMOUR (*Kansas Sta. Bul.* 289 (1940), pp. 57, figs. 5).—A survey of published work (71 titles) of many investigators who have studied both classes of wheat failed to provide consistent support for the view that the hard red spring wheats are superior in baking quality to the hard red winter wheats. When compared on the same protein basis, the two classes are found to be equal in intrinsic baking quality. The higher commercial rating which hard red spring wheats have received seemed attributable to their higher average protein content, greater uniformity, and their long established reputation for high quality. The hard red winter wheat arriving at the eastern seaboard usually has been much below the average of the wheat produced in the Southwest, particularly in protein content, which has created a poorer opinion of the whole class than is warranted. This is especially true of European importers who buy American wheat for blending with weaker sorts. The poorest part of the hard red winter wheat supply thus has tended to establish the reputation and to some extent the price of the whole class.

The long-time commercial evaluation of wheat, the author asserts, must be based on a very broad conception of quality, termed general utility value. This would include baking quality and many other factors, such as uniformity, protein content, specific adaptability, and even personal preferences. Many changes in these factors have occurred since hard winter wheats were first grown in the Southwest and more may be expected in the future.

Nitrates in relation to the toxicity of sodium chlorate, E. A. HELGASON (*North Dakota Sta. Bimo. Bul.*, 3 (1940), No. 1, pp. 9, 10, fig. 1).—Studies with Fargo clay in connection with research on control of perennial weeds confirmed the findings of Crafts (*E. S. R.*, 81, p. 511) and demonstrated that nitrates also reduce the toxicity of chlorates in this soil. Data are included on growth in height and fresh weight of Thatcher wheat as affected by several rates of sodium chlorate alone and with added nitrogen.

HORTICULTURE

Bi-serial r for horticultural research, J. W. CRIST. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 269-271).—The author states that the occurrence of measurements not expressible in cardinal numbers is somewhat frequent in horticultural research and necessitates groupings merely in the form of alternate categories with quantitatively indefinable and undefined limits.

Nevertheless, the degree of correlation with the variables concerned is desirable. The biometrical technic of the so-called biserial r is available for the purpose. The author demonstrates its use with reference to the relationship between the color of apple fruits and their content of total sugar, the data being not actual but assumed. The relation between this measure of correlation and that of the ordinary coefficient of correlation, together with the magnitudes of their errors in the same set of measurements, is briefly discussed.

[Horticultural studies by the Indiana Station], O. W. FORD, D. L. JOHNSON, C. E. BAKER, J. A. MCCLINTOCK, C. L. BURKHOLDER, J. D. HARTMAN, C. C. STAIR, F. C. GAYLORD, K. I. FAWCETT, J. E. DICKERSON, E. R. HONEYWELL, N. K. ELLIS, R. B. WITHROW, T. M. EASTWOOD, and R. K. SHOWALTER (*Indiana Sta. Rpt. 1939*, pp. 30, 31, 94-99, 100, figs. 5).—The following studies are briefly discussed as to progress: Spray residue removal, the use of sulfamic acid in spray residue removal, orchard soil management, apple stocks, apple spraying, plum and prune varieties, production of tomato seed, grading and fast freezing fruits and vegetables, factors affecting quality of mint oil, factors affecting quality of fresh and canned tomatoes, grading and standardization of peony blooms, production and marketing of muck and sandy soil crops, especially peppermint on muck, use of electric light in the greenhouse, and forcing of Easter lily seedling.

[Horticultural studies by the Vermont Station] (*Vermont Sta. Bul. 463* (1940), pp. 20-22, 24-28).—Brief reports are presented on the progress of cytological, breeding, and physiological studies with the violet; factors influencing the set of pear fruits; the development of an effective program for the control of apple scab, codling moth, and other pests of the apple; and fertilizer requirements of the apple.

Problems in vegetable and small fruit production on toxic orchard soils of central Washington, C. L. VINCENT. (Wash. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 680-684).—In plats established in the Wenatchee area on soils from which had recently been removed mature apple trees which in their bearing years had been heavily sprayed with arsenic-containing sprays, it was observed that rye made excellent growth and oats much slower development. Among vegetables, potatoes appeared to be fairly satisfactory for planting on newly reclaimed orchard soils. Tomatoes were stunted badly during the early season but recovered later to produce a crop of green fruits. Legumes, such as peas and beans, appeared most adversely affected by soil toxicity. The longer the period following the removal of the trees, the better was the development of the planted crops.

How the Blue Lake pole bean is grown in the State of Oregon, W. D. ENZIE (*Farm Res. [New York State Sta.]*, 6 (1940), No. 4, pp. 5, 11, fig. 1).—Information is given as to origin, varietal characteristics, fertilizer and cultural practices in Oregon, and potentialities for use in New York State.

Root-top ratio of the bush lima bean as an index of adaptability to ecological conditions, F. S. ANDREWS. (S. C. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 752-758, figs. 2).—Data taken on the young plants of several varieties grown under controlled greenhouse conditions showed pronounced differences in root development and in root : top ratios. Fordhook and McCrea (large-seeded varieties) were characterized by a low root : top ratio, and Henderson (small-seeded) by a high root : top ratio. Baby Fordhook, a cross between Fordhook and Henderson, had a root : top ratio intermediate between those of its parents. An examination of the roots of young plants showed Henderson and Baby Fordhook to form fibrous adventitious roots along the stem below the soil surface. Temperature had a profound influence on root growth with varieties responding differently.

In the field the roots of Henderson were much more extensive and numerous than in Fordhook, suggesting a greater capacity for water absorption and a greater capacity to withstand drought. The broad leaves and large blossoms of Fordhook make possible a greater loss than income of water during dry, hot weather and may account in part for the differences in root development which, in turn, depends on photosynthetic processes.

Fertilizer requirements for lima beans, V. A. TIEDJENS and L. G. SCHERMERHORN. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 743-746).—The application of hydrated lime to soil which was found to have less than 500 lb. per acre of replaceable Ca increased germination of Fordhook lima beans from 20 percent on the untreated to 80 percent on the limed area. An increase of the Ca in nutrient solutions from 10 to 20 p. p. m. stimulated the normal development and setting of the later flowers. In a series of plats on nutrient-deficient soil it was apparent that several years of fertilizer treatment may be necessary to bring the soil to the state of fertility suitable to the most effective production of lima beans. Of different sources of N used, tankage and calcium nitrate gave the best results on a soil of pH 6.0. Among varieties, Fordhook showed the most striking response to N fertilization, apparently having special need for an abundant supply. The indications were that this variety is generally given inadequate N under field conditions in New Jersey. A favorable C : N ratio was maintained by increasing the available N.

Effect of different environments on head shape in Marion Market cabbage, W. S. FLORY, JR., and J. C. WALKER. (Tex. Expt. Sta., U. S. D. A., and Univ. Wis.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 778-782).—An analysis of measurements taken on plants propagated from the same lots of seed but grown in Madison, Wis., and Weslaco and College Station, Tex., showed definite effects of the environment on the shape of heads, as indicated by length : width ratios. The heads were somewhat flattened in Wisconsin and distinctly elongated in Texas. Apparently, plants selected in a given locality to the point of apparent stability for certain characters may become unstable in these respects when transferred to a different environment. The need of adaptation of new varieties during their course of development to the region where they are to be grown is indicated.

Magnesium deficiency in cauliflower in Delaware County, New York, C. H. DEARBORN. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 773-777, fig. 1).—In studies of the B requirements of cauliflower there was observed a chlorosis distinct from that caused by deficiencies of N, P, K, Ca, or B. The injury was manifested first by a yellow mottling between the veins of the lower leaves. Young leaves rarely exhibited mottling. Field experiments in an area in which a crop of cauliflower had failed from chlorosis showed remarkable results from applications of MgO. As compared with no salable heads from a 130-ft. row for no MgO, there were 53 heads where 620 lb. of MgO was applied per acre. In another trial, even where no chlorosis was evident, significant increases in the number and weight of salable heads were obtained from the use of dolomitic hydrated limes. The field results were confirmed in greenhouse experiments in which soil brought from a deficient region was used.

The effect of large applications of nitrogen on the growth of celery, M. M. PARKER. (Va. Truck Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 697-701, fig. 1).—Golden Plume celery sown in the greenhouse about January 1 and transplanted the first of March to sash frames where the crop was grown to maturity was found to require very large applications of fertilizer to obtain best development. In fact, 2 tons of 6-6-5 material were insufficient to produce

maximum growth and optimum foliage color in plants set 6 by 10 in. in the frames. A supplementary treatment of 300 lb. of N per acre proved more effective and economical than either 100 or 600 lb. when applied in six fractional applications at weekly intervals in solution in the irrigation water.

Preliminary results of fertilizer placement for lettuce in raised irrigated beds, W. A. FRAZIER and W. T. McGEORGE. (Univ. Ariz.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 702-706).—Compared with broadcasting or drilling prior to making the raised beds, band placement of fertilizers gave highly significant increases in yield. The most effective placement was a single band 1.5 in. toward the furrow side from the seed row and 3 in. deep. This procedure permitted lateral movement of the phosphates underneath the plant row as a result of repeated furrow irrigations and finally developed a wide band well placed for nutrient absorption by the roots. Band placement gave more uniform growth and percentage of cut-outs for the first harvests.

Inoculation studies with the garden pea in California, H. A. JONES and B. L. WADE. (U. S. D. A. and Calif. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 718-724).—In 4-yr. comparisons of garden peas from inoculated and control plats at Davis, the control plats significantly outyielded the inoculated during the first 2 yr., but in the last 2 there was no significant difference. The first 2 yr. the Hundredfold variety was used; the last 2, Laxton Progress and Giant Stride. The first-year yield of green vines was significantly higher in the inoculated than in the control plats. In 3-yr. comparisons of yields of seed and straw, using Laxton Progress and Giant Stride, there was no significant difference between inoculated and control plats, and tests at Manteca for one season using these two varieties showed no significant differences in yield of market peas, dry seed, and straw. Commercial cultures of three to five strains of *Rhizobium leguminosarum* prepared for peas were used each year.

Effect of roasting and scalding pimiento pepper fruits to remove the skins prior to canning on the subsequent germination of the seed, H. L. COCHRAN. (Ga. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), p. 679).—Data recorded over a 2-yr. period showed that fire roasting or oil scalding of pimiento fruits to remove the skins reduced the germination of the seed to the point of 14.1 and 14.6 percent, respectively, as compared with 92.1 percent for seeds taken from freshly harvested fruits. Furthermore, the seedlings from the heat-treated lots were often stunted or showed other abnormalities, such as adhering seed coats, ball heads, or single cotyledons.

Heterosis in summer squash (*Cucurbita pepo*) and the possibilities of producing F_1 hybrid seed for commercial planting, L. C. CURTIS. (Conn. [New Haven] Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 827, 828).—Having observed that the F_1 plants from a cross of two summer squashes produced female blooms 10 days earlier than either parent and were unusually uniform in growth and fruiting, the author took definite records on a succeeding planting. On comparable areas the two parents, Connecticut Straightneck No. 10 and Early Prolific Straightneck and the F_1 progeny produced 27, 25, and 59 fruits yielding 17, 15, and 58 lb. in total weight, respectively.

Improved methods of tomato production in Georgia, H. L. COCHRAN (*Georgia Sta. Bul.* 206 (1940), pp. 34, figs. 20).—In connection with general information as to varieties, plant production, culture, harvesting, marketing, control of pests, etc., there are presented data on the yield of a number of varieties over a period of several years and on the effect of fertilizers on early and weekly yields of the Marglobe variety. Louisiana Pink, Penn State Earliana, and Pritchard were the most productive kinds. An application of 600 lb. per acre

of a 6-8-6 fertilizer not only increased total yields but stimulated early yields of Marglobe, as compared with no-fertilizer treatment.

The Victor tomato, A. F. YEAGER (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 1, pp. 3-6, figs. 3).—Originated from a cross of the Allred × Break O'Day varieties, Victor possesses the determinate growth habit of the Allred and the smoothness of the fruit of Break O'Day. The new variety is described and is recommended for trial as an early market tomato for Michigan.

The use of nutrient solutions in the transplanting water for tomato plants, 1939, E. C. STAIB and J. D. HARTMAN. (*Ind. Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 913-915).—Records taken on field experiments with two nutrient solutions added to the water placed around the roots of Indiana Baltimore tomato plants at the time of setting in the field showed a slightly significant gain from the treatment in the first picking in one instance and none in the other. When total yields were analyzed, the gains from nutrient starters were of no significance as compared with water alone. At no time during the season was there significant difference in growth to distinguish the plats from one another. Samples collected in early November showed the soil of the field to be very low in available phosphoric acid and K, suggesting that low availability of P, as indicated by rapid soil tests, is not a reliable criterion to the benefits that might be expected from the use of phosphates in the starter solution.

A comparison of nutrient solutions for transplanting tomatoes and for packing southern plants for shipment, C. B. SAYRE. (*N. Y. State Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 905-909).—A mixture of two parts of Ammo Phos 11-48 and one part of potash proved as effective as, and more economical than, any other combination of chemicals tested. A mixture of equal parts of mono-K phosphate and diammonium phosphate was also very effective. Nutrient solutions containing N, P, and K were more effective than those lacking any one of these ingredients. The important influence of the starter solutions was in assisting the plant to become established quickly, with earlier maturity as a result. Treatments were particularly useful for southern-grown plants or local plants grown under crowded conditions which resulted in a depleted nutrient condition.

The response of tomatoes to fertilizer ingredients, F. K. CRANDALL and T. E. ODLAND. (*R. I. Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 923-926).—Investigations in the field and in concrete frames showed that N was the only one of the fertilizer ingredients under test which consistently affected the yields. There was a tendency for plats receiving the high-N fertilizer to produce a greater percentage of fruit of No. 1 grade. Under field conditions, where stable manure, green manure, and fairly liberal applications of mixed fertilizers were used, P rarely limited production, not only in tomatoes but also of other vegetables. The same general situation prevailed with respect to K.

Pruning unstaked tomatoes, L. R. HAWTHORN. (*Tex. Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 930-934, fig. 1).—That pruning of unstaked tomato plants to either 1 or 2 stems is a profitable practice was indicated in results obtained over a 3-yr. period at Winter Haven, Tex. In terms of marketable fruit harvested per acre during the first 4 pickings, covering a period of about 2 weeks, the average yields for the 3 yr. for unpruned, 1-stem, and 2-stem plants were 580, 2,504, and 2,155 lb., respectively. For the entire season of 11 pickings, the average yields were 12,860, 13,030, and 15,356 lb., respectively. Pruning plants to 2 stems per plant is suggested as an advisable practice.

Fruit thinning the watermelon, A. D. HIBBARD. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 825, 826).—None of various methods of thinning watermelons increased the total yield per acre as compared with no treatment, but the largest melons and the greatest number per acre of over 26-lb size were secured when the fruits were thinned to two per vine. The maximum total yield in pounds per acre was secured where no thinning was done.

Behavior of Malling apple rootstocks in soils of high, medium, and low moisture contents, H. B. TURKEY and K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 305-310, figs. 2).—Uniform, well rooted 1-year-old trees planted individually in glazed crocks of 10-l capacity were supplied with water to simulate (1) dry midsummer, (2) favorable moisture, and (3) excessive moisture conditions. On an oven-dry basis the percentages of moisture were 14.9, 17.3, and 23.1, respectively. In general, growth was greater under high than under low soil moisture conditions. There was noted, however, a variation in the response of different clones. For example, during the period of active growth, Malling VII trees showed yellowing of foliage under high moisture and grew better than any other stock under low moisture. Roots of all stocks were generally of smaller diameter in soil of low moisture and stockier in soil of medium moisture. Roots were shortest in soils of high moisture. The results agreed with field observations, and on the basis of the study the Malling stocks are classified as to moisture requirements.

The comparative performance of several standard apple varieties on certain rootstocks, principally the clones Malling I, II, and XIII, R. H. SUMDS. (W. Va. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 311-318, fig. 1).—At Kearneysville, W. Va., Red Rome on Malling I was very variable as a young orchard tree. Stayman Winesap on Malling I gave uniformly semi-standard trees. Red Rome on Malling XIII at from 7 to 8 yr. was somewhat smaller than standard size. Stayman Winesap on Malling XIII was vigorous but late in beginning fruiting. Malling II tended to dwarf somewhat its combinations with Jonathan, Starking, Staymared, Golden Delicious, York Imperial, and Gallia Beauty. Malling II apparently required a deep, fertile soil.

A comparison of the coefficients of variability of the top weights of York Imperial and Gallia Beauty trees on seedlings and on clonal stocks showed no material difference except that Gallia Beauty on seedlings was significantly more variable than when on T-200. However, when trunk circumferences were compared, trees on seedling roots were considerably more variable. The author concludes that certain environmental factors, such as soil type, may be more potent in determining uniformity than are clonal rootstocks.

Relation of cracking of graft coatings to the stand and growth of apple scions, H. A. CARDINELL. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 291-293).—Apple cleftgrafts on which eight melted wax formulas, seven water-emulsified asphalts, and two nondrying plastic materials were tested gave evidence that the plastic materials resulted in poor stand and poor growth of scions and that the average of the asphalt coatings was as good as that of the brush waxes. Based on the stand of scions at the end of one season's growth, the conclusion is reached that there was no relationship between waxes that cracked little or not at all and those that cracked severely or fell off entirely. Apparently, other factors may be more responsible for stand and growth of scions than whether or how severely the union coating cracks.

The relationship between structure, chlorophyll content, and photosynthesis in apple leaves, W. F. PICKETT and A. L. KENWORTHY. (Kans. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 371-373).—York Imperial, Jonathan, and Wealthy trees grown in the greenhouse from January to June 1938 were weighed before planting and at digging time to measure photosynthetic activity

during the period in the beds, and quantitative determinations were made of chlorophyll a plus b. Total leaf area was measured, and leaf samples were collected for studies of the ratios of internally exposed leaf surface. Determinations made of water, ash, total acid-hydrolyzable carbohydrates, and total N following digging showed no material difference between varieties. York Imperial accumulated the least, Jonathan an intermediate, and Wealthy the greatest amount of total dry matter per unit meter of leaf surface. No significant difference was found between varieties in chlorophyll content. The ratios of the amounts of internally exposed surface to external surface were 10.09, 12.6, and 15.31 for York Imperial, Jonathan, and Wealthy, respectively, with a mean difference of 0.68 being significant. The coefficient of correlation between the ratio of the internally exposed surface and photosynthetic activity was +0.7, and between chlorophyll content and photosynthetic activity it was +0.24. The results indicate that the extent of the internally exposed surface was more important than chlorophyll content as a factor partially governing photosynthetic activity.

Thinning the apple crop by spray at blooming.—A preliminary report, V. R. GARDNER, T. A. MERRILL and H. G. PETERING. (Mich. Expt. Sta.) (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 147-149).—Tests made in the spring of 1939 with different concentrations of a large number of spray materials to determine their effectiveness as blossom-killing agents when applied at the full-bloom stage showed dinitrocyclohexylphenol to be the most effective killing agent. At concentrations as low as 0.1 percent, some flowers of Duchess apples were killed, with no apparent injury to the foliage. At concentrations of 1 percent, nearly all flowers were killed, with considerable accompanying foliage injury. At concentrations of from 0.25 to 0.50 percent, large percentages of the flowers were killed, accompanied by some but not serious foliage injury. Addition of a wetting agent so as to provide a concentration of 0.1 percent increased considerably the effectiveness of the spray. Similarly, the addition of a proprietary wax emulsion to provide concentrations of from 1-8 up to 1-24 increased the effectiveness of the spray.

What new apple varieties are doing: A survey of growers, R. WELLINGTON and H. O. BENNETT (*Farm Res. [New York State Sta.]*, 6 (1940), No. 4, pp. 2, 9).—This is a further report (*E. S. R.*, 83, p. 775) on varieties originated by the station or recommended as the result of extended trials.

Physiological studies with McIntosh apples in modified atmosphere cold storage, A. VAN DOREN. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 453-458, figs. 5).—Certain modifications in the storage atmosphere were found to favor the keeping life of McIntosh apples. A reduction in the rate of respiration to a desired minimum occurred in an atmosphere of 5 percent CO₂ and 2 percent O₂ at 40° F. Upon further increment of CO₂ with O₂ at 2 percent, the respiration was further reduced, but evidence of CO₂ injury was noted. At 40°, an atmosphere of 10 percent CO₂ and 11 percent O₂ reduced the rate of respiration, as compared with that in air, less than other atmospheric conditions used. Only control of ventilation was needed to produce a summation of 21 percent of CO₂ and O₂.

Firmness and crispness, as indicated by the pressure test, were greater in fruits with slow rates of respiration. No physiological injury occurred in the fruits stored in an atmosphere of 5 percent CO₂ and 2 percent O₂ at 40°, and this condition produced the longest storage life and the longest period of marketability. A study of the soluble pectin changes indicated that the conversion of protopectin to soluble pectin is retarded in certain modified atmospheres and following the removal of the fruit therefrom.

Some additional effects of waxing apples, R. M. SMOCK. (Cornell Univ.) (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 448-452, fig. 1).—Continuing the investigation (E. S. R., 76, p. 796), the author reports that coating of Golden Delicious apples with Brytene wax emulsion 489A checked materially the rate of shriveling. At a relative humidity of 60 percent, waxing of Golden Delicious with a dilution of 1:1 resulted in a slightly less weight loss than occurred with no wax at a relative humidity of 95 percent. Heating the emulsion to 90° F. reduced weight loss slightly, apparently by giving a better covering. It was observed that some wax emulsions have a slight retarding effect on the development of scald and bitter pit in Rhode Island Greening, while other waxes had no benefit or actually increased the trouble. The use of proper wax emulsions enhanced the appearance of certain varieties, and certain aromatic varieties, such as McIntosh, were improved in aroma.

The waxing of deciduous fruits, L. L. CLAYPOOL. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 443-447, fig. 1).—During 1938 and 1939 over 600 waxing tests were made on a wide range of fruits, using wax emulsions of different concentrations and holding the fruits for several days after waxing at 45° F. to determine the effects. The principal benefit recorded was in reducing water loss. Benefits were greatest in fruits with thin cuticles, with a possible exception of the apricot. Carnauba wax resulted in a brighter, more attractive finish, but was not as effective as paraffin in controlling water loss when used in like concentrations. With the exception of the apricot, greater amounts of wax could be applied to stone than to pome fruits. Waxing did not overcome decay and, in fact, aggravated decay in some instances. The inclusion of a fungicide, such as borax, was found of doubtful value.

Influence of carbon dioxide in lengthening the life of Bartlett pears, F. W. ALLEN. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 473-478).—Employing various storage atmospheres, modified by manipulating the percentage of CO₂ and O₂, the author found that at any given temperature the keeping life of Bartlett pears may be materially lengthened, as compared to fruits in ordinary storage. A concentration of 10 percent CO₂ was considered the optimum and was particularly effective when the O₂ was reduced to 5 percent. Fruit held in nitrogen without CO₂ and with only 2.5 percent O₂ was delayed in maturity (not as much as where CO₂ was employed) and often developed undesirable flavors.

Texas studies on the cold requirements of peaches, S. H. YARNELL. (Tex. A. and M. Col.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 349-352, figs. 4).—Data taken on greenhouse tests of forty-odd varieties, the budwood of which was obtained from different localities in Texas, showed that the locality where grown had a profound influence on the response of any given variety, rendering it impossible to set a minimum cold requirement for any one variety which will hold universally. For example, in Elberta budwood grown in Winter Haven and in the Wichita Valley, development was more rapid in the southern material. Considering only the hours below 45° F., the author found that Elberta was ready to bloom normally after about 400 hr. at Winter Haven and after about 1,200 hr. in the Wichita area. The data suggest a progressive development of fruit buds toward flowering condition which is conditioned by both "cool" and "warm" temperatures. It was possible, however, to classify varieties according to their needs for low temperature and base practical recommendations as to adaptation.

Relative effect upon peach production of nitrogen derived from certain fertilizer sources, C. A. McCUE (*Delaware Sta. Bul.* 222 (1940), pp. 8, fig. 1).—This is a revision in bulletin form of an earlier-noted paper (E. S. R., 76, p. 335) and points out again that, in general, N derived from inorganic

fertilizers gave better returns than N from organic sources. Leguminous cover crops may provide sufficient N for the trees in the early years, but are not adequate as the trees come into fruiting.

The relative cold resistance of some species of *Prunus* used as stocks, R. L. WINKLEPLECK and J. A. MCCLINTOCK. (Purdue Univ. et al.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 324-326).—Under controlled laboratory conditions in which stem and root cuttings of different rootstock materials were subjected to different uniform temperatures, there were observed great differences in the capacity to withstand low temperature. Florida peach (probably Peento) grown from pits exhibited the most serious injury of any of the materials. Elberta seedlings also showed little resistance. Considerable variation was noted in materials grown from southern natural seedlings. Myrobalan plum was more resistant than any of the peach materials except that *P. davidiana* was slightly more hardy than Myrobalan in the top tissue. *P. americana* was the hardiest of all the stocks tested. Marianna plum exhibited marked resistance during the first 2 hr. of the test, but in longer exposure was not equal to *P. americana*. On the whole there was a close correlation in the behavior of the roots and tops of any given material.

Twig growth in mutants of Montmorency cherry, J. W. CRIST. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 245-249, figs. 2).—A biometrical analysis of the basic type and rate of vegetative growth in barren Montmorency mutants as compared with this phenomenon in normal, fruit-bearing limbs and trees of the same variety indicated fundamental sameness in the law and type of this growth, but a hereditary difference with respect to rates. The specific rate constant for the mutant form appeared to be lower. This, coupled with a relative deficiency in rate of carbon assimilation, offers a physiological explanation, in part at least, of the failure of barren mutants to form fruit buds and their perpetual barrenness.

Methods of retarding the ripening of strawberries in northern Michigan, B. L. EGGER (Michigan Sta. Quart. Bul., 23 (1940), No. 1, pp. 20-26, figs. 3).—Seeking to take advantage of late-season advances in prices of berries in important markets, such as Detroit and Chicago, studies were made of various factors that might retard maturity in the field. The results indicated that by selection of site and soil and by the proper use of mulches the grower could influence maturity to a moderate extent. The location of beds on northern slopes retarded the ripening of Dunlap plants by as much as 9 days. An additional 4-day delay was secured by planting on clay loam or sandy loam. The time of removing mulch had very little effect on the beginning of ripening, but a delay in removal did influence the midseason pickings significantly. Nitrogenous fertilizers did not influence the date of ripening but did increase the amount of fruit set and the yield, when moisture was not a limiting factor.

The effects of mulching red raspberries on growth and production, J. H. CLARK. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 604-608).—The mulching with salt-marsh hay of Latham red raspberries growing on Sassafras sandy loam underlaid with a gravelly subsoil was found beneficial with respect to growth and yield, particularly where the basic fertilizer treatment was supplemented each spring with an additional 1,000 lb. of 5-10-5 material plus 200 lb. of NaNO_3 each autumn. Both the number and the size of canes were notably larger in the mulched plats. Soil temperatures during midafternoon in July were notably lower under the mulch. Studies of root distribution showed more roots in the surface 2 in. under mulch than under cultivation. In the case of the Ranere variety there were more roots per cane in the cultivated area than under mulch. In Latham there were somewhat more roots under the mulch than under cultivation.

Breeding autumn-fruited raspberries, G. L. SLATE (N. Y. State Exp. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 574-578).—Observations on the autumn fruiting of various red raspberries suggested that varieties may be divided into three natural groups with respect to this character, as follows: (1) Ranere, (2) polyploid varieties, such as Erskine Park and La France, and (3) Lloyd George and its derivatives. The possibilities of Lloyd George as a parent for autumn-fruited raspberries were revealed in a planting of seedlings of N. Y. 1950 and Lloyd George, among which were three autumn fruiters, one of which was named Indian Summer. In crosses between Indian Summer and its sibs, other Lloyd George seedlings and other nonautumn-bearing varieties, the autumn-fruited characteristics were observed in many of the seedlings. Some were superior to Indian Summer, indicating that Lloyd George and its offspring are the best sources yet discovered for the breeding of desirable autumn-fruited red raspberries.

Tennessee Autumn red raspberry, B. D. DRAIN (*Tennessee Sta. Cir.* 70 (1940), pp. 4, figs. 4).—A descriptive account is given on the origin, habits of growth, and plant and fruit characters of a new variety of raspberry obtained from a cross of a hybrid (Latham \times Van Fleet) and Lloyd George.

The heat required to bring Tokay grapes to maturity, A. J. WINKLES and W. O. WILLIAMS. (*Univ. Calif.*). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 650-652).—In 1929, 1931, 1934, and 1936, years in which Tokay grapes were rated as very good in quality at the time of harvest the heat summations, that is, the total of mean daily temperatures above 50° F. from bloom to harvest, were 2,265, 2,320, 2,280, and 2,260 day degrees. Heat summations for the ripening period, namely, the 28 days preceding harvest, were 640, 760, 690, and 730 day degrees, respectively. In years in which the quality was rated acid or very acid, the heat summations for the growing period fell below 2,100 day degrees. Heat summations for the ripening period, however, were not as consistently correlated with quality as were those for the longer period. The value of heat summations for supplementing the present Balling standard as indications of the proper stage for harvesting Tokay grapes is discussed.

Identification of acetaldehyde among the volatile products of citrus fruits, J. B. BIALE and A. D. SHEPHERD. (*Univ. Calif.*). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 545-547, fig. 1).—An acetaldehyde derivative was obtained from the vapors given off by citrus fruits following subjection for from 12 to 25 days to restricted ventilation obtained by placement in glass containers with inlet and outlet tubes unsealed. Oranges and lemons stored continuously in air or in an artificial atmosphere of 10 percent CO₂, 10 percent O₂, and 80 percent N₂ did not show any acetaldehyde in the gaseous emanations. Storage in N₂ alone resulted in the production of none or very little acetaldehyde, but when the fruits were transferred to air a large amount of acetaldehyde was found in the emanating vapors. This was not true in the case of fruit transferred from air to N₂, from air to modified atmosphere, or the reverse. The transfer from N₂ to air also resulted in an increase of CO₂ evolution.

Changes in invert sugar and sucrose during ripening of Arizona grapefruit, R. H. HILGEMAN and J. G. SMITH. (*Univ. Ariz.*). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 535-538, fig. 1).—Observations on fruit collected from commercial groves and from N-fertilized plats near Yuma, Ariz., showed that total sugars usually increased until midwinter and then declined. Sucrose increased rapidly in early fall and decreased in late winter and early spring. The periods of these changes varied with locality and with cultural practices. Limitation of the N supply tended to increase the supply of sugar in the fruit and to accelerate the hydrolysis of the sucrose. Heavy nitrate fertilization had the opposite

effect Invert sugars, calculated as percentage of total sugar, decreased during a brief period in autumn and then increased at a gradually accelerated rate. It is suggested that the low point in this trend might serve as an index of maturity, since maximum amounts of sucrose are associated with ripening.

The effect of spacing on plant development and yield of dill (*Anethum graveolens* L.), H. L. SEATON and W. D. BATEN. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 785-789; *abs. in Michigan Sta. Quart. Bul.*, 23 (1940), No. 1, p. 39).—On the basis of individual development, plants spaced 16 in. apart were significantly larger in all respects than those spaced 12, 8, or 4 in. apart. The 16-in. spacing produced more branches, more compound umbels, taller plants, larger primary umbels, larger stems, greater green and air-dry weight of entire plant, greater weight of air-dry stems and seeds, a higher percentage of seeds, and heavier seeds than spacing at closer intervals. No significant differences were exhibited by any of the four spacings on the number of primary rays in the primary umbels. This is partially explained by the fact that the effects of crowding were not operative during the early differentiation of the primary inflorescences. However, when the data are put on the basis of 0.01-acre plots, the closer spacing of 4 in. would be significantly more profitable for the grower who is producing the crop at a specified price per ton. This 4-in. spacing produced about twice as many umbels as the 16-in. interval. The number of primary rays in the primary inflorescences, on a 0.01-acre basis, was nearly four times that produced at the 16-in. spacing. As the primary umbel constitutes the most important portion of the crop, this is a highly significant consideration for the grower. The data indicate that even a closer spacing of the plants than 4 in. may be highly desirable for maximum acre yields, and that the rows may be spaced closer together than the 3-ft. spacing given in this experiment. The analyses of air-dry seeds for moisture and ether-extractable materials show no significant differences between the seeds from the plants grown at the different spacings.

Cinder and gravel culture of greenhouse flowering plants, A. LAURIE and R. HASEK. (Ohio State Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 956-960).—Carnation plants grown in either sand or gravel and subirrigated with nutrient solutions produced more flowers with longer stems than comparable plants in soil. Favorable results were secured with roses and lilies. An increase in the K content of the nutrient solution increased further the yield of the Lucile Hill rose. An attempt to supply additional carbohydrates during cloudy weather by adding glucose to the rose plats gave no strikingly positive results in February and March. In the case of sweet peas, glucose additions resulted in earlier germination, due, probably, to bacterial action on the hard seed coats. The use of selenium in nutrient solutions gave negative results as a means of controlling red spiders on roses.

House plants, J. B. WINGERT (*Iowa Sta. Bul. P14, n. ser.* (1940), pp. 393-432, figs. 30).—Among subjects considered are general environmental requirements, propagation, containers, soils, fertilization, need of rest periods, summer care, and specific cultural needs of 20 important species. In addition, there is presented a tabulated list of miscellaneous house plants suitable for general culture under home conditions.

The relationship of temperature to flower bud formation in chrysanthemums, K. POSE. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1005-1006).—In studies with Copper City, Betty Watkins, and Princeton varieties it was observed that the subjection of young plants to low night temperatures interfered with flower bud formation, delayed flowering, and decreased the number of buds per stem as compared with holding plants at night in high

temperatures. Plants given low light intensity and high temperature did not form flower buds as freely as those given high light intensity. Shoots which failed to form flowers during the early fall at high temperatures remained blind during the winter even though the temperature was increased. Late pinching and late planting are believed to delay bud formation until the temperature is reduced to the point where it prevents flower bud formation.

Bud formation, abscission, and flower production of gardenia as affected by light and temperature, C. G. KEYES. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1034-1036).—Bud formation of gardenias occurred equally well at a night temperature of 60° F. as at 55°, but was seriously curtailed when the night temperature was 70°. Supplementary illumination did not consistently increase the number of buds formed in all treatments. Bud abscission was increased at a night temperature of 70°. Supplementary illumination did not reduce bud abscission even at low temperatures (55° or 60°). Flower production was increased by supplementary illumination only when the temperature was high (70°) during the light period and low during the subsequent period of darkness. A low-temperature period (55° or 60°) following supplementary illumination did not increase bud formation and did not reduce bud abscission.

Root growth and flower production of roses in soil and soil-peat mixtures of varying moisture contents, K. D. BRASE. (N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 963-966, figs. 3).—In the case of Ami Quinard rose plants grown in boxes of Ontario loam soil, with and without added peat moss and with moisture contents maintained at three levels—low, medium, and high—the greatest root development was made under high moisture conditions. The addition of peat moss was distinctly beneficial, especially with the low and medium moisture cultures. Root formation was more active in the presence of peat moss, the root systems in soil-peat mixtures forming dense masses of fine, actively growing laterals. Gain in weight of shoot growth was greatest in plants in soil-peat of medium moisture content. The smallest gain was made by plants in soil of low moisture content. Flower production was also greatest in the soil-peat mixture of medium moisture content.

Interrelationships of calcium and phosphorus concentrations on the growth of roses, J. G. SEMLEY and O. W. DAVIDSON. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 967-972, fig. 1).—In studies of the effect on growth and composition of Briardiff rose plants of varying Ca and P concentrations of the nutrient solution maintained at different pH levels it was found that the ratio of Ca:P is of significance in the growing of roses. The effective ratio was not narrow but extended over a range easily obtainable in practice. Apparently, the need of Ca as a direct nutrient for the rose is moderate. The plants receiving 50 p. p. m. of Ca and 100 p. p. m. of P exhibited good branching, a large number of basal shoots, excellent foliage color, and a large number of blooms. This treatment apparently was the best in the experiment. P was apparently needed by the rose more than by the peach, apple, and other horticultural plants.

The effect of sulphur on growth of roses in an alkaline soil, J. C. RATSEK. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 973-977).—That the application of S may be beneficial to roses growing in alkaline soils was indicated in studies conducted in central Texas on a black calcareous prairie soil. The three varieties used, Red Radiance, Talisman, and Joanna Hill, responded somewhat differently. In the initial year the two latter varieties increased their flower production consistently as the soil reaction became increasingly acid. Under highly buffered conditions, necessitating S in amounts

greater than 10 lb. per 100 sq. ft., the break-down and subsequent soil acidification was slow. Under less highly buffered conditions, necessitating S in amounts less than 10 lb. per 100 sq. ft., oxidation and soil acidification was rapid but the return to alkalinity was also rapid, necessitating frequent applications of S. When S is used in amounts greater than from 10 to 15 lb. the nitrate concentration in the soil may be reduced to 0. In the experiment there was no evidence that nitrate deficiency resulted in any material decrease in flower production.

Rose growing for the home gardener, J. C. RATSEK. (*Texas Sta. Cir.* 90 (1940), pp. 27, figs. 9).—This contains general cultural and varietal information.

The zinnia (State flower of Indiana), E. R. HONEYWELL (*Indiana Sta. Cir.* 254 (1940), pp. 16, figs. 20).—General information is presented on the history and development of the zinnia, varieties and types, culture, seed production, display and utilization, insect and fungus pests, etc.

Factors affecting shoot growth and flower bud formation in rhododendrons and azaleas, H. T. SKINNER. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1007-1011, fig. 1).—The production of vegetative shoots by leaf-bud cuttings of *Leucothoe catesbaei*, *Rhododendron ponticum*, and *R. roseum elegans* was encouraged by either high temperatures or long days. A temperature of from 75° to 80° F., regardless of day length, resulted in a high percentage of shoot growths. Maximum elongation of shoots from leaf-bud cuttings occurred under conditions of high temperature and continuous light. The length of vegetative shoots of mature plants of azaleas and rhododendrons was affected more by day length than by temperature. Significantly greater numbers of flower buds were produced at temperatures of from 75° to 80° by *Azalea obtusa* Hinodigari and Pink Pearl and *R. carolinianum* and *R. mucronulatum* than at temperatures of from 50° to 55°. Short-day treatments resulted in more flower buds on *R. carolinianum* and *R. mucronulatum*, but had little effect with other varieties tested.

Chinese elm in Michigan, A. B. BOWMAN (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 1, pp. 27, 28, fig. 1).—Describing the Chinese elm and discussing its desirable qualities, such as very rapid growth and adaptability to pruning, the author points out certain undesirable features, such as excessive seed dropping, rapid root penetration, brittleness of twigs, etc., that make the species less valuable as a street or shade tree.

FORESTRY

A selected bibliography of North American forestry, E. N. MUNNS (*U. S. Dept. Agr., Misc. Pub.* 364 (1940), vols. 1, p. [1]+636; 2, pp. II+637-1142).—Contained herein are a total of 21,413 references to the more important literature on forestry subjects published in Canada, Mexico, and the United States prior to 1930. The material is systematically classified by subjects, with authors alphabetically arranged under each grouping. Volume 2 contains (pp. 1087-1142) an author index.

[Report of the department of forestry], D. DENUYL, J. C. KASE, and R. C. BRUNDAGE (*Indiana Sta. Rpt.* 1939, pp. 85-91).—Included are progress reports upon studies in woodlot management, development of tree species by the experimental forest nursery suitable for field planting, windbreak plantings, marketing Indiana woodland products, and log grading.

[Forest resources of North and South Carolina] (*U. S. Dept. Agr., Forest Serv., Forest Survey Release Nos.* 1 (1939), pp. [1]+III+30, pl. 1, figs. 3; 2,

pp. [I]+III+31, pl. 1, figs. 3; 3, pp. [2]+III+34, pl. 1, figs. 3; 4 (1940), pp. [I]+III+46, figs. 7; 5, pp. [I]+III+48, figs. 9).—Presented in mimeographed form are papers dealing with the forest resources of the northern Coastal Plain of South Carolina, by E. B. Faulks; of the Piedmont region of South Carolina, by W. T. Hicks; of the southern Coastal Plain of South Carolina, by E. B. Faulks and A. R. Spillers; and of the southern and northern Coastal Plain of North Carolina, both by J. W. Cruikshank.

[Forestry studies by the Vermont Station] (*Vermont Sta. Bul.* 463 (1940), p. 19).—Among studies discussed are the photosynthetic activity of forest trees, factors influencing the rate of diameter growth of white pine, and influence of soil temperature on the development and transpiration of ponderosa pine and sugar maple seedlings.

Living and forest lands (*U. S. Dept. Agr., Misc. Pub.* 388 (1940), pp. IV+48, figs. 18).—This is a guide prepared by the Forest Service for study groups interested in the social and economic aspects of forests and forestry.

The influence of locality, season, time of day, and year on the visibility of smoke columns, G. M. JEMISON. (*U. S. D. A.*) (*Jour. Forestry*, 38 (1940), No. 5, pp. 435-437, fig. 1).—An analysis of some 21,000 observations made from lookout stations in the eastern United States, using the Byram haze meter, showed significant differences in average visibility distance in different areas. Such variations are explained on the basis of population density and industrial activity, since the smoke of homes and factories accounts for the larger part of the atmospheric haze. Visibility on all forests is generally highest during May, June, and September. The time of day that observations are made was also a factor in visibility.

Fire Control Notes, [July and October 1940] (*U. S. Dept. Agr., Forest Serv., Fire Control Notes*, 4 (1940), Nos. 3, pp. II+101-159, figs. 26; 4, pp. II+161-206, figs. 18).—In the same manner as before (*E. S. R.*, 83, p. 343), these quarterly numbers present brief articles relating to fire research and fire control, with special reference to organization, planning, and equipment.

Vegetative succession following logging in the Douglas fir region, with special reference to fire, L. A. ISAAC. (*U. S. D. A.*) (*Jour. Forestry*, 38 (1940), No. 9, pp. 716-721).—Studies on sample plats laid out in 15 widely scattered areas in western Washington and Oregon following logging operations in 1926 showed a rapid rise in percentage of total weed-brush cover until about the third year following cutting. Unless interrupted by fire or further cutting there are 4 rather distinct stages of succession before the forest again reaches the climax type. These stages are designated as moss-liverwort, weed-brush, intolerant even-aged Douglas fir, and finally the tolerant all-aged hemlock-balsam fir. The weed-brush stage is most subject to fire and may be greatly prolonged by fire. Certain exotic species of grass and weeds were found to be upsetting the natural succession, but some of the new grasses were actually improving grazing conditions. Light cover favored and heavy cover was detrimental to coniferous seedlings. Successive fires impoverished the soil, favored the herbaceous plants, retarded brush species, and eliminated the coniferous seedlings.

The results of laboratory tests as applied to large scale extraction of red pine seed, E. J. ELLASON and C. E. HERT (*Jour. Forestry*, 38 (1940), No. 5, pp. 426-429, fig. 1).—In connection with a heavy crop of seed in 1933, a temperature of 130°-140° F. for 72 hr. was used in extraction because of a higher net output of seed. Some evidence was seen that the cleaning apparatus, consisting of revolving brushes, injured some of the seeds. The damage was more evident in sand tests than in sample germination tests. A reduction in the speed of the brushes corrected the situation. Another type of injury, the

splitting of seed along the suture, was traced to too high a relative humidity in the kiln.

Kiln schedule for extracting red pine seed from fresh and stored cones, R. C. RIETZ and K. E. KIMBALL. (U. S. D. A. and Univ. Wis.). (*Jour. Forestry*, 38 (1940), No. 5, pp. 430-434, figs. 2).—The yield of seed obtained from red pine cones kiln-dried with forced-air circulation at different temperatures and lengths of time was found dependent on cone moisture content, the lower the moisture the greater the cone opening. All the temperatures 120°, 130°, 140°, 150°, and 160° F. yielded strongly viable seed at an equilibrium moisture content of 3 percent, but at 6 percent viability was reduced sharply at 160° and somewhat at 150°. It is suggested that this injury must be associated with the increased duration of heating at the higher moisture percentage. Cones held in gunny sacks for some time before kiln treatment were more sensitive to high temperature than those held in trays. A drying condition of 150° with 3 percent wood equilibrium moisture content was the most severe drying condition that produced good yields of uninjured seeds.

Successful storage of southern pine seed for seven years, M. L. NELSON. (U. S. D. A.). (*Jour. Forestry*, 38 (1940), No. 5, pp. 443, 444).—Observations on the viability of samples of seed from the 1931 crop of longleaf, slash, loblolly, and shortleaf pines placed in screw-top glass jars and held at 35°-38° F. and at room temperature showed all samples at room temperature to have become almost or completely nonviable in 4 yr. or less. At the end of 7 yr. there was no deterioration in any of the four species of seeds stored cold. Stratification for 10 days in wet peat moss at low temperatures hastened the germination of loblolly and shortleaf pines, was harmful to longleaf seed, and of no material significance in the case of slash pine seed.

Early planting experiments in the spruce-fir type of the southern Appalachians, L. S. MINCKLER. (U. S. D. A.). (*Jour. Forestry*, 38 (1940), No. 8, pp. 651-654).—Discussing the results of planting experiments with 20 species set out from 1923 to 1931 in 78 plats near Mount Mitchell, N. C., the author states that southern balsam fir, red spruce, red pine, and Norway spruce appeared best suited for reforestation in the southern Appalachian spruce-fir type. Norway spruce was the only exotic finding a favorable environment in the area. All species were more successful on an east than on a south slope, but red pine was less exacting in this respect than the 3 leading species. Southern balsam fir showed the best survival and growth of all 20 species and has real merit for recreational and watershed protection uses, but its wide use is considered questionable because of its relatively poor quality as lumber.

Effect of season of cutting on sprouting of dogwood, J. H. BUELL. (U. S. D. A.). (*Jour. Forestry*, 38 (1940), No. 8, pp. 649, 650, fig. 1).—Observations 3 yr. after cutting on the sprouting of dogwood trees cut at nine different times from March 1 to August 2 showed that midsummer fellings of 1-in. dogwoods produced clumps 2.5 ft. shorter and 1.5 ft. narrower on the average than did late winter fellings. The author suggests that, if the purpose is to eliminate dogwood, summer cutting would be more effective. On the other hand, if perpetuation of the dogwood is desired, winter cutting would be more desirable than summer.

Topsoil changes in coniferous plantations, G. M. DAY. (U. S. D. A.). (*Jour. Forestry*, 38 (1940), No. 8, pp. 646-648).—A comparison of the soil within and without plantations of white pine, Norway pine, Scots pine, and Norway spruce, located in Vermont and New York, showed an increase in organic content of the top soil wherever a mull had developed. On the other hand, where no mull had formed the organic content was lower in the plantation than in the

top soil of adjacent open areas under grass cover. The surface layers of mineral soil in the plantations were about twice as permeable to water as those in the adjacent open areas. The mull soils showed a greater increase in permeability than did the mors. The results emphasized the need of conserving existing soil values and for starting restorative processes as soon as possible on critical areas.

Effect on trees of wind-driven salt water, A. E. Moss. (Univ. Conn.). (*Jour. Forestry*, 38 (1940), No. 5, pp. 421-425, fig. 1).—Observations following the New England hurricane of September 21, 1938, showed effects of wind-driven salt spray despite the accompanying heavy rainfall as far as 45 miles from the ocean, particularly on sensitive species such as white pine (*Pinus strobus*). Among resistant species were Colorado blue spruce, Austrian pine, pitch pine, and red pine. Injury was most severe where trees or plants were exposed to the direct force of the wind. Injury was noted on foliage, on wintering over buds, and on woody stems.

Cost of producing pulpwood on farm woodlands of the Upper Connecticut River Valley, V. S. JENSEN (*U. S. Dept. Agr., Forest Serv., 1940*, pp. [4]+17+VIII, pls. 6).—Using data obtained for 19 pulpwood operations employing 57 workmen in the vicinity of Colebrook, N. H., the costs of felling, limbing, peeling, bucking, piling, skidding, yarding, and trucking are analyzed for different species of wood, different size crews, etc.

DISEASES OF PLANTS

The Plant Disease Reporter, [October 1 and 15, 1940] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 24 (1940) Nos. 18, pp. 361-380, pl. 1, fig. 1; 19, pp. 381-397, figs. 2).—The following items are noted:

No. 18.—Diseases of fruits and vegetables on the New York market during the months of January, February, and March 1940, by J. S. Wiant and C. O. Bratley; root knot injury to peach trees and other plants in Kansas, by J. O. Miller; tobacco disease survey in Wisconsin, 1940, by J. Johnson; prevalence of elm dieback caused by *Dothiorella ulmi*, by E. G. Kelsheimer and C. May; unusual collections of destructive fungi on plantain and violet in the District of Columbia area, by A. E. Jenkins; hosts for *Pucciniastrum ericae* in America, by W. W. Diehl; host-parasite check list revision (continued), including *Betula*, by F. Weiss; and brief notes on ergot (*Zizania aquatica angustifolia*) on wild rice in Maine, corn diseases in Virginia, and bean rust (*Uromyces phaseoli typica*) in the Laurentian Mountains of Quebec.

No. 19.—Flag smut of wheat found in Washington, by F. D. Heald and C. S. Holton; stem rust on fall-sown oats at Fayetteville, Ark., by H. R. Rosen; pink root disease (*Phoma terrestris*) of onions on tomatoes, by H. H. Thornberry and H. W. Anderson; curly top of tomato in southern California in 1940, by J. T. Middleton; *Celastrus scandens*, a new host for *Glomerella cingulata*, by A. J. Watson; plant diseases in Massachusetts in September, by O. C. Boyd; some obscure peach diseases in Washington, by L. K. Jones; host-parasite check list revision, including *Bignonia* through *Byrsionima*, by F. Weiss; brief notes on *Sclerotinia* rot of beans in New York, rust (*Puccinia peridermiospora*) causing injury to ash trees in New Hampshire, and recovery of eelgrass on the North Carolina coast; and unusual development of rusts on small grains in Oklahoma, by K. S. Chester.

[Phytopathological work by the Indiana Station]. (Partly coop. U. S. D. A.). (*Indiana Sta. Rpt. 1939*, pp. 11, 12, 17, 54-60, 61-64, figs. 7).—A general summary of recent plant disease and breeding work by the station is followed by brief reports of progress (by R. C. Baines, R. W. Samson, H. R. Thomas,

V. Wright, G. B. Cummins, A. J. Ullstrup, A. M. Brunson, G. M. Smith, R. M. Caldwell, and L. E. Compton) on tests of eradicant fungicides for apple scab control; frame of dormant sprays to control apple blotch; physicochemical studies of the virus causing tomato mosaic and its transmission by seed; southern-grown plants as sources of bacterial wilt in Indiana tomato fields; tomato collar rot epidemic of 1930 traced to setting of infected plants; nitrogen nutrition of tomato seedlings as affecting susceptibility to collar rot; resistance to defoliation diseases in tomato; the taxonomy of plant rust fungi; the importance of *Helminthosporium* leaf spot and ear rot of corn in Indiana; a new kernel blemish in dent corn due to abnormal development of the kernel; effects of barrenness and defoliation on stalk rot of corn; wilt resistance in new sweet corn hybrids and inbreds; effects of leaf rust and artificial defoliation on yield, composition, and quality of winter wheats; effects of powdery mildew on yield of wheat; effects of seed treatments on yield of winter wheat seed shriveled by stem rust; and release of Wabash, a new wheat resistant to leaf rust.

[Plant disease studies by the Vermont Station] (*Vermont Sta. Bul.* 463 (1940), pp. 28, 29).—Progress is briefly reported on studies of aging of plants in relation to fertilizers and apple scab attack and the long-time potato scab project.

Diseases and pests observed during the year, J. M. WATERSTON (*Bermuda Dept. Agr. Rpt.*, 1939, pp. 28–30).—Seasonal notes on crop plant diseases in Bermuda.

Diseases of cultivated plants in the Province of Santa Fé, Argentina [trans. title], E. SCHILL (*Inst. Expt. Invest. y Fomento Agr. Ganad. [Santa Fe, Argentina]*, *Bol. Tec.* 13 (1939), pp. 25).—An annotated list arranged alphabetically by Latin names of host plants.

Phytosanitary aspects of the principal plants cultivated in Espirito Santo [trans. title], S. G. DA SILVA (*Rev. Soc. Brasil. Agron.*, 2 (1939), No. 4, pp. 80–84).—Diseases and pests of coffee, cacao, cereals, cotton, sugarcane, cassava, fruit trees, vegetables, and miscellaneous crop plants are briefly considered.

New and interesting plant diseases, W. C. MOORE (*Brit. Mycol. Soc. Trans.*, 24 (1940), pt. 1, pp. 59–63, pl. 1).—*Septoria* leaf blotch of *Lobelia*, *Septoria* sp. and *Ascochyta bohémica* on *Campanula*, and root and bulb rots of tulips caused by *Pythium* are briefly considered.

[Fungi and plant diseases] (*Indian Sci. Cong. Proc. [Lahore]*, 26 (1939), pp. 115–118).—Abstracts of the following papers are included: Taxonomic Studies of Indian Smuts, by B. B. Mundkur; On the Characters of *Ooanophora cucurbitarum* (B. and Rav.) Thaxter, Causing a Wet Rot of Chillies, by S. Sinha; A New Species of *Bombardia* Occurring on Dry Twigs of *Thunbergia grandiflora* Roxb., by G. S. Verma; An Abnormal Sterile Form of *Polystictus sanguineus* Linn., by S. R. Bose; A Wet Rot of Leaves of *Colocasia antiquorum* [=cuculenta] Due to Secondary Infection by *Blakeslea trispora* and *Ooanophora cucurbitarum* (B. and Rav.) Thaxter, by S. Sinha; Investigation of Orange Rot in Storage, by P. N. Ghatak; Studies in the Diseases of *Mangifera indica* Linn.—II, Investigation Into the Pathological Histology of the Fruits Affected With Black-Tip Disease, by S. N. Das Gupta and S. Sinha, and III, On the "Die-back" Disease of the Mango Tree, by S. N. Das Gupta and A. T. Zachariah; *Neotiella catharinaea* McLennan and Halsey on *Catharinaea mülleri*, by S. N. Das Gupta and T. S. Sadasivan; and Effect of Certain Poisonous Chemicals Upon the Spores of *Acrothecium lunatum* and *Cephalothecium roseum*, *Acrothecium lunatum* on *Pennisetum typhloideum* [=glaucum] Ears, A Study of *Monascus* Occurring in Orange-Squash, and Two Species of *Spicaria* From Interesting Habitats, all by G. S. Dhillon.

The structure and life-history of the root parasite *Dactylanthus taylori* Hook. f., L. B. MOORE (*New Zeal. Jour. Sci. and Technol.*, 21 (1940), No. 4B, pp. 206B-224B, figs. 35).—The distribution, habit, and habitat of *D. taylori* are briefly described and its hosts enumerated. A somewhat detailed account is given of the morphology of various parts of the plant, including its junction with the host root. Several doubtful points of floral structure—e. g., number of stamens and loculi, nature of ovules and seed—are dealt with. Germination, the establishment of the young plant on the host root, subsequent development, and vegetative reproduction are described. The peculiar features of the plant are briefly discussed and the position of the subfamily in current classification upheld.

An *Elsinoë* on *Toddalia*, A. E. JENKINS and A. A. BITANCOURT. (U. S. D. A. et al.). (*Philippine Agr.*, 29 (1940), No. 1, pp. 55, 56).—The type species *Isotewis toddaliae* on *T. asiatica* is transferred to *E. toddaliae*. *Toddalia* thus becomes the fifth rutaceous genus on which a species of *Elsinoë* or *Sphaceloma* has been found, the four others being *Citrus*, *Hesperethusa*, *Pleiospermium*, and *Fagara*.

The geographical distribution of the genus *Gymnosporangium*, I. H. CROWELL (*Canad. Jour. Res.*, 18 (1940), No. 9, Sect. C, pp. 469-488, figs. 43).—Species of this genus are said to occur only in the Northern Hemisphere and most abundantly in the temperate parts. Each of the 3 major continents contains a distinctive *Gymnosporangium* flora and, except for 3 species called the "tricontinental species," individual species occur naturally on 1 continent only. There are about 48 species, and 33 occur in North America, 15 in Asia, and 6 in Europe. Explanations of the types of geographical distribution are given under 4 categories: Species occupying all potential territory covered by the coincident ranges of their alternate hosts, species confined by the range of their "primary" telial host, localized species confined within a portion of the coincident ranges of their alternate host, and widely distributed species that are not limited in their range by either alternate host group.

Cancerous tumor or crown gall of plants [trans. title], V. WELLBORN (*Café el Salvador*, 10 (1940), No. 114, pp. 437-446, figs. 8).—A general discussion of crown gall due to *Phytoplasma tumefaciens* and the relations of insects to infection, with special reference to the attack on the coffee shade trees ("pepetos"—species of *Inga*).

A study of *Uromyces scirpi* Burr., M. FORT (*Brit. Mycol. Soc. Trans.*, 24 (1940), pt. 1, pp. 98-108, pl. 1, figs. 11).—All stages were found—urediospores and teliospores on *Scirpus maritimus* and spermatogonia and aecia on *Oenanthe crocata*. No aecia were present on *Glaux maritima*. Inoculations repeatedly infected *Oenanthe* but not *Glaux*. *S. maritimus* was artificially infected from *O. crocata*. The morphology and cytology are described. It is suggested that the aecia found on *O. crocata* belong to a different specialized race of *U. scirpi* from those on *G. maritima* and, further, that the binucleate condition is due to migration to the aecial initials of the products of the nucleus of a spermatium which has fused with and entered one of the spermatogonial paraphyses.

Host plants of the brown rot fungi in Britain, H. WORMALD (*Brit. Mycol. Soc. Trans.*, 24 (1940), pt. 1, pp. 20-28, pls. 2).—Of the two found in Britain, *Sclerotinia lara* is the cause of blossom wilt of fruit trees and ornamental shrubs of species of *Pyrus* and *Prunus*, while *S. fructigena* is the fungus most frequently found associated with fruit brown rot. Observations on the occurrence of the first on pome fruits and of the second on stone fruits are described. Cross-inoculations with these fungi from various hosts have yielded positive results on a number of other hosts.

Some fungi isolated from pinewood soil, M. ELLIS (*Brit. Mycol. Soc. Trans.* 2; (1940), pt. 1, pp. 87-97, fig. 1).—"Twenty-one species, belonging to 11 genera, were isolated from samples of pinewood soil. *Trichoderma* spp. and *Botrytis cinerea* preponderated, followed by *Penicillia* and members of the *Mucorales*. Most of the species have been found in various soils by other investigators, and may be regarded as characteristic of acid forest soils in temperate climates. There appeared to be little or no difference between samples taken at 4-in. and at 10-in. depths, the same species being present in both samples. A new species of *Mortierella* is described."

Virus diseases of plants and their study [trans. title], V. D. SILVEIRA (*Rev. Soc. Brasil. Agron.*, 2 (1939), No. 4, pp. 61-79, figs. 29).—A general (28 references), copiously illustrated review of virus diseases of plants and the technics of studying them.

The sizes of plant viruses, F. C. BAWDEN (*Chron. Bot.*, 6 (1940), No. 1, pp. 13, 14).—A general discussion.

The relation of viruses to plant tissues, C. W. BENNETT. (U. S. D. A.). (*Bot. Rev.*, 6 (1940), No. 9, pp. 427-473).—"It is the purpose of this paper to assemble as much as possible of the evidence [about four pages of references] bearing on the relation of plant viruses to specific tissues and to point out some of the deductions that may seem justified by the information that has been made available up to the present time."

Investigations on the problem of the biological characterization of phytopathogenic virus proteins [trans. title], G. A. KAUSCHE (*Arch. Gesam. Virusforsch.*, 1 (1940), No. 3, pp. 362-372, figs. 12).—A critical examination of the results of studies by the author and others regarding the nature and properties of plant virus proteins.

The microflora of the rhizosphere in relation to resistance of plants to soil-borne pathogens, A. G. LOCHHEAD, M. I. TIMONIN, and P. M. WEST (*Sci. Agr.*, 20 (1940), No. 7, pp. 414-418, figs. 3).—Comparative studies were made of micro-organisms in the rhizosphere, respectively, of wilt resistant and susceptible flax varieties and of black root rot resistant and susceptible tobacco varieties. Both quantitative and qualitative evidence was accumulated indicating modifications in the rhizosphere which suggested inherent differences between the resistant and susceptible varieties studied, in that there was a more pronounced "rhizosphere effect" in the case of the susceptible plants.

Seed-borne diseases present problems, W. F. CROSBY (*Farm Res. [New York State Sta.]*, 6 (1940), No. 4, pp. 1, 10, figs. 2).—A brief review of the problems involved and summary of recent work by the station on seed-borne diseases of peas, beans, vetch, small grains, and corn.

An analysis of factors causing variation in spore germination tests of fungicides.—II, Methods of spraying, S. E. A. MCCALLAN and F. WILCOXON (*Contrib. Boyce Thompson Inst.*, 11 (1940), No. 4, pp. 309-324, figs. 5).—Methods of obtaining spores have been considered previously (*E. S. R.*, 82, p. 783). The present paper compares the relative precision of four methods of spraying fungicides in the laboratory, using tests in which brilliant blue dye was sprayed, then dissolved off the slides, and the amount determined in a colorimeter. A comparison of observed deposit of various copper fungicides in a settling tower with that expected by calibration with the dye showed an average agreement within 5.4 percent. Comparisons of the methods by actual spore germination tests favored the settling tower. It is concluded directly from the dye and indirectly from spore germination tests that the settling tower method is the most precise, followed in order by stationary horizontal sprayers, free-hand spraying with controlled pressure and time, and last, freehand spraying

with a bulb atomizer. The equipments developed and found most satisfactory for the first two of these methods are described and illustrated.

p-Dichlorobenzene as a vapor fumigant, F. R. DARKS, H. E. VERMILION, and P. M. GROSS (*Indus. and Engin. Chem.*, 32 (1940), No. 7, pp. 946-949, figs. 4).—*p*-Dichlorobenzene has come into successful use in combating the downy mildew or blue mold of tobacco. The data here presented indicate the pronounced influence of crystal size and of temperature on the rate of vaporization of *p*-dichlorobenzene. For estimation of the amount of vapor in the atmosphere, four methods were tried out, the results favoring a procedure for making estimations in seedbeds in which sodium hydroxide is used for drying, and the small amount of moisture passing by it is allowed for by a blank determination on the *p*-dichlorobenzene-free atmosphere from an adjacent bed. This is subtracted from the weight of the *p*-dichlorobenzene condensed out in the determination paralleling the blank. This method of freezing out *p*-dichlorobenzene in a tared condenser proved as accurate as the combustion method. It could not only be carried out more quickly, but was also more easily applicable to field conditions and was sufficiently accurate for the purpose. Data on the vapor pressure—necessary to field and laboratory experimentation—are also presented.

Formaldehyde and steam mixture for sterilizing greenhouse soil (*Agr. News Letter*, 8 (1940), No. 5, pp. 71, 72, fig. 1).—The procedure followed is a modification of that described by Beachley (E. S. R., 78, p. 346). Only one treatment a year between spring and fall crops is ordinarily required. The beds are filled to a depth of about 1 ft. over tile piped for steam from a 2-in. line. A reservoir for formaldehyde, connected into this by a 1½-in. pipe with valve, has a sight glass on the side which enables the operator to determine how fast the formaldehyde level drops as it is fed into the line. The beds are first covered with rubberized canvas. Steam alone is used for the first 3 hr., while during the last hour formaldehyde is mixed with the steam at the rate of 100 lb. per bed of 4,732 sq. ft. The process thus requires only 4 hr. as against 8 to 15 hr. formerly required where steam alone was used for soil sterilization. The saving in fuel for generating steam is said to more than offset the cost of the chemical.

Different methods of combating smut (*Ustilago bromivora*) of rescue grass (*Bromus unioloides*) [trans. title], M. O. BENTANCUR (*Arch. Fitotec. Uruguay*, 3 (1939), No. 2, pp. 170-173, fig. 1; *Eng., Ger. obs.*, p. 173).—Rescue grass was included in the grass tests at the National Plant Breeding Institute "La Estanzuela" because of its importance as a forage crop, but it proved susceptible to this smut and in a very severe form. Of four seed treatments tried (three with hot water and one with formalin), immersion in water for 110 min. at 47°-48° C. gave the best results.

Mosaic of spring cereals in the Voronezh district, V. K. ZAZHUKLO and G. M. SERNIKOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 26 (1940), No. 5, pp. 474-478, figs. 2).—Among the spring grains mosaic was found to attack soft and hard wheats, three oats species, and barley. External and internal symptoms are described, *Deltocephalus striatus* is shown to be a vector of the virus, and two viruses are shown to infect these spring grains, viz. winter wheat mosaic and a virus disease named "zakuklivanie," characterized by profuse growth of shoots, antholysis, and floral proliferation.

Interrelations between the virus of a new grain mosaic disease (zakuklivanie) and its carrier *Delphax striatella* Fallen, K. S. SUKHOV and M. N. SUKHOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 26 (1940), No. 5,

pp. 479-482).—*D. striatella* is shown to be a vector of this disease of the small grains, an incubation period of at least 6 days in the insect being necessary to transmission of the virus. Of 108 larvae collected as they were emerging from winter hibernation, 20.3 percent were shown to be infective when tested on healthy oats grown under isolation. After long search the disease was also found in some perennial grasses (e. g., *Agropyron repens* and *Bromus inermis*), but never exceeding 0.01 percent incidence. It is thus concluded that the main factor in the overwintering of the virus is the insect vector. *Setaria* (= *Chaetochloa*) *viridis* and *Panicum crusgalli* (= *Echinochloa crusgalli*) have also been found affected by this disease, and 15 percent infection was obtained in rice by artificial inoculation. Inoculated into oats, the virus spread in the tissues at the rate of about 7 cm. per hour.

Wheat stem rust and old and new varieties in 1940, L. R. WALDRON (*North Dakota Sta. Bimo. Bul.*, 3 (1940), No. 1, pp. 7, 8).—While far-reaching conclusions are not deemed possible from the one experiment (Fargo, 1940) discussed, in which many named old varieties with some new varieties and selections were included, it is noted that rust caused marked injury on the late and very susceptible sorts, the very resistant wheats underwent but little damage, while the earlier and partly resistant varieties showed only moderate damage. It is not thought necessary to assume that the older varieties have "run out" or deteriorated, but more likely that the factors building up a rust epidemic have become modified through the years than that the wheat varieties themselves have changed.

Wilt disease of abacá, or Manila hemp (*Musa textilis* Née), B. S. CASTILLO and M. S. CELINO (*Philippine Agr.*, 29 (1940), No. 1, pp. 65-85, figs. 5).—This presents the results of a general study by which it was shown through morphological, cultural, and inoculation experiments that the fungus associated with abacá wilt is identical with *Fusarium oxysporum* f. 3 (= *F. cubense*). cause of banana wilt.

Studies on the control of internal breakdown of table beets by the use of boron, G. J. RALEIGH, O. A. LORENZ, and C. B. SAYRE. (Cornell Univ. and N. Y. State Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 791, 792).—An abstract.

The effect of different forms of copper in sprays and dusts on vine growth, fruit production, leaf injury, and disease of cantaloupes under field conditions: Progress report, H. L. STIER and C. H. MAHONEY. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 815-820).—In this test on the Eastern Shore (1939), all the copper sprays and dusts used markedly decreased defoliation and disease in cantaloupes. Bordeaux mixture, yellow copper oxide, red copper oxide, Basi-Cop, Grasselli Compound A, and Duo-Copper were used in the sprays; and yellow copper oxide, red copper oxide, Cupro-K, and monohydrated copper sulfate in the dusts. The greatest marginal chlorosis occurred on plants in the bordeaux and yellow copper oxide spray plats, and sprays when compared with dusts containing the same compounds and applied approximately at the same rate per acre in terms of Cu caused significantly greater marginal chlorosis. Although the Cu appeared to be the principal cause of this injury, it seemed to be influenced also by soil moisture, fertility level, and weather conditions. Compared with one another or with the control plats, none of the treatments caused significant differences in the total number of fruit set. Bordeaux and Basi-Cop sprays and red copper oxide dust plats showed a significantly greater number of fruits in the crown set than the controls, but length of the main stem was similar for plants in all plats including the controls.

Relative nodulation of varieties of *Medicago sativa* varying in susceptibility to alfalfa wilt, J. T. KROULIK and P. L. GAINES. (Kans. Expt. Sta.).

(*Soil Sci.*, 50 (1940), No. 2, pp. 135-140).—No evidence was obtained to indicate any association of resistance of *M. sativa* to infection by *Rhizobium meliloti* with resistance to infection by *Phytophthora insidiosa*. The results of the study substantiated previously reported data from various sources that highly significant differences in infectivity may be expected to arise from inoculating *M. sativa* with different strains of *R. meliloti*, that highly infective strains are relatively inefficient in nitrogen fixation, and that highly significant differences in the amount of nitrogen fixed may result when different strains of *R. meliloti* are used on the same variety of alfalfa or when the same strain of *R. meliloti* is used for inoculating different varieties.

Most cauliflower varieties resistant to cabbage yellows, O. A. REINKING and W. O. GLOVER (*Farm Res. [New York State Sta.]*, 6 (1940), No. 4, p. 8).—Controlled greenhouse tests under favorable conditions for infection—temperature being the most important factor—indicated that while all cauliflower strains used were susceptible to infection, some showed much more resistance than others. It appears that in case especially virulent races of the causal *Fusarium* should ever be encountered resistant cauliflower strains could readily be developed.

A study of horseradish diseases and their control, K. J. KADOW and H. W. ANDERSON (*Illinois Sta. Bul.* 469 (1940), pp. 529-583, figs. 23).—This handbook, in addition to describing the plant and its taxonomy, its importation into America, its geographical distribution, and the cultural practices used for it, presents data on leaf diseases, virus diseases and "deterioration," and root rots, in each case discussing such matters as the symptoms, cause, host plants, overwintering of the causal agent, and control.

The occurrence of onion yellow-dwarf in New Zealand, E. E. CHAMBERLAIN and G. T. S. BAYLES (*New Zeal. Jour. Sci. and Technol.*, 21 (1939), No. 4A, pp. 229A-236A, figs. 4).—A serious virus disease recently appearing in New Zealand seems to be identical with yellow dwarf as described in other countries. Although it has been observed in the field only on onions, it has been transmitted experimentally to shallots. The virus overwinters in infected bulbs and is transmissible by artificial inoculation and by four species of aphids tested. Regulations to prevent its spread are outlined.

Insects as vectors of yellow dwarf, a virus disease of onions, H. D. TATE (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 14 (1940), No. 3, pp. 267-294).—In transmission tests with this virus, successful infection was obtained by transfer from diseased to healthy plants with 48 aphid species, but all tests with other insects (two doubtful exceptions) gave negative results. The incubation period in the plant proved to be relatively short—7-12 days in most cases, with an average of 10.3 days. Aphids acquired the virus during the first feeding on diseased plants and immediately thereafter were capable of infecting healthy ones. Infective aphids fed either on healthy susceptible or immune hosts, or confined without food, became nonviruliferous within a few hours. Under certain conditions the symptoms became completely masked, not becoming evident until after the bulbs had undergone a rest period and had then been regrown. However, such plants served as sources of infection. Although the onion plant serves only as an incidental or transitory host of aphids in Iowa, observations indicated that they are present in sufficient numbers and at the proper time to play an important role in field dissemination of the disease. Control may be accomplished by destruction of left-over bulbs in the field coupled with planting of disease-free sets grown in non-infected areas. The disease was transmitted by aphids to over 30 varieties of cultivated onions, but tests with a large number of other plant species gave negative results.

A comparison of New Improved Semesan Bel and different strengths of yellow oxide of mercury as materials for treating seed potatoes under Long

island conditions, H. S. CUNNINGHAM (*New York State Sta. Bul.* 694 (1940), pp. 13).—The data presented, based on experiments conducted in 1936-38, indicate that under Long Island conditions treating Green Mountain seed with any of the materials used is unlikely to result in increased yields, and in certain years they may be adversely affected. From this and previous work, treating Green Mountain seed is not recommended unless it is heavily infested with *Rhizoctonia*. Treating Irish Cobbler seed may be expected to give increased yields, and it is also evident that much weaker mixtures of yellow oxide of mercury will be more advantageous than the stronger mixture formerly recommended and will materially reduce the cost. New Improved Semesan Bel is recommended for Irish Cobblers but not for Green Mountains on Long Island. Regardless of strength, the emergence of both Irish Cobblers and Green Mountains is delayed by treating the seed with yellow oxide of mercury, and during the period of this test New Improved Semesan Bel had the same effect in 2 out of 3 yr. This delayed emergence does not affect subsequent growth and certainly does not adversely affect the yield of Irish Cobblers.

Bacterial wilt and ring rot disease of potatoes, E. W. BODINE. (Colo. Expt. Sta.). (*Calif. Dept. Agr. Spec. Pub.* 174 (1940), pp. 99-102).—A brief general discussion of the disease due to *Phytophthora septentrionalis* and its status in Colorado.

Rhizoctonia solani and *R. crocorum* in Argentina [trans. title], J. B. MARCHIONATTO (*Jour. Agron. y Vet., Univ. Buenos Aires*, 1939, pp. 327-341, pls. 2, figs. 10).—On potato infection by these two fungi, with mycological comparisons and control methods. There are 18 references.

The endophyte of rye-grass (*Lolium perenne*), J. C. NEILL (*New Zeal. Jour. Sci. and Technol.*, 21 (1940), No. 5A, pp. 280A-291A, figs. 9).—Evidence is given to indicate that an endophytic fungus is normally present in the leaves of plants of certified perennial ryegrass in New Zealand when grown from seed of the current season's harvest. A method of culture is described which has resulted in the consistent isolation of a fungus from endophyte-bearing seedlings and from detached leaves. The identity of the fungus has not yet been determined.

U. S. 200 X 215, a new sugar beet variety resistant to leaf spot, G. H. COONS and D. STEWART. (U. S. D. A.). (*Sugar Jour.*, 3 (1940), No. 2, pp. 7-10)

Atlas of the pests and diseases of the sugar beet, L. DECOUX and G. ROLAND (*Atlas des ennemis et maladies de la betterave*. Bruxelles: A. & G. Bulens Bros., 1938, pp. 56, figs. 20).—A handbook illustrated in color.

Report to the Provincial Deputation on the sugarcane disease in the Fourth Department of the Island of Puerto Rico, C. GRIVOT GRAND-COURT, A. STAHL, and J. J. ACOSTA Y CALBO (*Informe dado a la asamblea. Diputacion Provincial sobre la enfermedad de la caña de azucar en el Cuarto Departamento de la Isla de Puerto Rico*. [Mayaguez]: Romero, 1939, pp. 53).—This is a reprinting of a report made in 1876 by the above authors on a disease of sugarcane which evoked great interest in the 1870's, with an introduction by O. F. Bravo. The various sections of the report deal with the grave situation created in Puerto Rico by this disease, a brief description of it and the history of its spread, the disease per se and its relations with insects, unsuccessful remedies and collected observations, its importance in Mauritius and Bourbon (Réunion), remedies and advice including the authors' insistence upon the substitution of new varieties which from their observation had proved resistant, and the nomenclature of the new cane varieties introduced into Mauritius from 1870 to 1872.

Chlorotic streak, a virus disease of sugarcane reported in Louisiana, *Sugar Bul.*, 13 (1940), No. 18, pp. 1, 2).—A brief summary of the present status of this disease in the United States.

A progress report on the study of chlorotic streak of sugarcane in Louisiana, E. V. ABBOTT. (U. S. D. A.). (*Sugar Bul.*, 18 (1940), No. 19, pp. 3-6).—The known distribution in Louisiana, varieties affected, effects of the disease on germination and yields of sugarcane, relation of drainage and soil type to its prevalence, and control measures are considered.

Hot water treatment of seed cane, C. W. EGGERTON and I. L. FORBES. (La. Expt. Sta.). (*Sugar Bul.*, 18 (1940), No. 18, pp. 4, 5).—The results of preliminary experiments with the hot-water method are summarized, the following points of interest being brought out: This treatment apparently destroys all the chlorotic streak virus, cane with this disease and not treated sometimes germinates very poorly and the young shoots produced often fail to develop satisfactorily, and the effect of the hot-water treatment on cane free from chlorotic streak apparently depends on weather conditions during the following winter. In some years better stands are obtained, while in others the effects are not so satisfactory. More work needs to be done before definite recommendations can be made.

A tobacco vein-banding necrosis, E. E. CHAMBERLAIN (*Nieuw Zeel. Jour. Sci. and Technol.*, 21 (1940), No. 54, pp. 271A-275A, fig. 1).—A disease causing necrosis of foliage and stems of tobacco is reported as recently appearing in the Nelson District of New Zealand. The evidence presented suggested that it is due either to a strain of tobacco mosaic or to a mixed virus one component of which is tobacco mosaic and the other a virus not transmissible by artificial inoculation.

Tobacco varieties resistant to "cabeça" virus [trans. title], A. R. LIMA and A. S. COSTA (*Rev. Agr. [Brasil]*, 15 (1940), No. 3-4, pp. 133-140, fig. 1; *Eng. abs.*, pp. 139, 140).—Several commercial varieties of tobacco and species of *Nicotiana* were tested for resistance to this virus, probably identical with tomato spotted wilt (*Lycopersicon virus 3*). *N. glauca* was infected artificially but with difficulty, and under natural conditions it was practically immune. The cross *N. tabacum* × *N. glauca* was not tested on account of poor development, but the allotetraploid proved resistant as compared with Turkish tobacco. A strain of Sumatra tobacco proved resistant, as verified by 3 years' trials in the field, and inoculated plants showed a smaller number of lesions but a more severe necrosis than two other varieties tested. It is pointed out that the resistance of this variety may lie in its greater ability to localize the virus.

Solubility studies on purified tobacco mosaic virus, H. S. LORINE (*Jour. Gen. Physiol.*, 23 (1940), No. 6, pp. 719-728, fig. 1).—Different samples of purified tobacco mosaic virus show a relatively wide variation of solubility in $(\text{NH}_4)_2\text{SO}_4$ solution. This variation and the type of solubility curve obtained in the presence of varying amounts of solid phase indicate that the purified virus, whether isolated by mild treatment with $(\text{NH}_4)_2\text{SO}_4$ or by ultracentrifugation, is not a homogeneous chemical substance but contains more soluble and less soluble virus fractions of comparable specific activities. Long contact with strong $(\text{NH}_4)_2\text{SO}_4$ solutions or 0.1 M phosphate buffer results in a decreased solubility. The variation in solubility of samples isolated from different plants by the same method seems to depend in part on the length of time the plants have been inoculated before the cuts are made, and probably also on the conditions under which they are grown. Virus preparations isolated from plants of different genera grown under the same conditions and inoculated at the same time, however, behaved like identical substances in solubility experiments. There are 16 references.

Purification of tomato bushy stunt virus by differential centrifugation, W. M. STANLEY (*Jour. Biol. Chem.*, 135 (1940), No. 2, pp. 437-454, figs. 3).—

the amount per leaf was also considerably less than in the controls, and the K was reduced even more. The total N was also low compared with the control trees.

Boron deficiency of apples, A. B. BURRELL (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), p. 52).—An abstract in which terms are suggested for the different symptoms manifested.

The influence of bordeaux mixture on the rate of photosynthesis and transpiration of apple leaves, F. W. SOUTHWICK and N. F. CHILDERS. (Ohio Expt. Sta. and State Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), p. 374).—An abstract.

The effect of two mild sulphur sprays on the photosynthetic activity of apple leaves, E. L. AGNEW and N. F. CHILDERS. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 379-383, fig. 1).—Tested in six separate experiments, three of which involved the commercial Sulfix dry lime-sulfur and three the Magnetic Spray wettable sulfur, these sprays showed little or no injurious effects on photosynthetic activity except for one test where the Sulfix dry lime-sulfur was used. In this test the reduction in assimilation was associated with the highest maximum temperatures, which ranged from 83° to 86° F. for the first 3 days after spraying. After application of the Magnetic Spray sulfur, the daily temperature reached 83° on 2 days and was above 80° on 6 of the test days in this group of three tests. From these results and those of other workers, it is believed clearly evident that sprays containing sulfurs in suspension have less effect on photosynthesis of apple leaves than sprays containing sulfurs in solution.

"Peach mosaic disease in western Colorado," E. W. BODINE. (Colo. Expt. Sta.). (*Calif. Dept. Agr. Spec. Pub.* 174 (1940), pp. 78-81).—A brief general discussion of peach mosaic, said to be the most serious peach disease in Colorado.

The effect of certain fungicides on the photosynthetic activity of sour cherry leaves, L. M. MURPHY. (Mich. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 375-378).—"From this study, it appears that from the standpoint of photosynthetic efficiency Cupro K is superior to Coposil, 6-8-100 bordeaux, and lime-sulfur as a spray for sour cherries."

A new copper spray for cherry leaf spot control, R. H. DAINES (N. J. State Hort. Soc. News, 21 (1940), No. 4, pp. 1226, 1237, fig. 1).—In a 3-yr. test of various copper fungicides on cherries, the one material appearing most satisfactory from the standpoints of cost, adherence of spray residue to foliage, control of leaf spot, and practical noninjuriousness was home-made copper phosphate, directions for the preparation of which are given.

"The red stele disease of strawberries," HAROLD E. THOMAS. (Univ. Calif.). (*Calif. Dept. Agr. Spec. Pub.* 174 (1940), pp. 105-109).—A general discussion of the disease due to *Phytophthora* and its status in California.

Observations on a disease of citrus [trans. title], F. R. MILANEZ (*Rodriguezia*, 4 (1940), No. 13, pp. 199-263, pls. 18, figs. 7).—The present study, including a review of the literature (35 references), led the author to the conclusion regarding a diseased condition in citrus trees involving death of the fibrous roots that an endophytic fungus, as a true parasite, is the immediate cause of the death of those roots, which have been previously impoverished by a fungus-insect association (*Boletus tropicus* and *Pseudococcus comstocki*) acting superficially. The host-parasite relations are discussed in detail and illustrated.

Necrosis of the coffee tree [trans. title], V. WELLBORN (*Rev. Inst. Defensa Café Costa Rica*, 10 (1940), No. 70, pp. 75-84).—On phloem necrosis of coffee and its insect transmission.

A preliminary report of pecan leaf scorch studies, M. B. HARDY, H. LUTZ and S. MERRILL, JR. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 489-492).—The results reported indicate a significant decrease in the incidence of leaf scorch following treatments designed primarily to increase the water supply to a tree or to decrease the rate of water loss by transpiration. It was also shown that the incidence was greater on fruiting than on nonfruiting shoots, but whether this relationship was due to increased demand for moisture or for some nutrient element has not yet been definitely determined. Observations and other data presented showed leaf scorch to be more severe in years of less rainfall, under conditions where root crowding was excessive, and in soils with low water-holding capacity and fertility.

The anthracnose of persimmon [trans. title], S. GONÇALVES DA SILVA (*Biologico*, 6 (1940), No. 5, pp. 125, 126).—A note on this disease of persimmon—also affecting various other tropical fruits—due to *Collectotrichum gloeosporioides* and its control, including resistant varieties.

The wilt disease of *Ricinus* in the northeast [trans. title], S. C. ARBUDA and J. DESLANDES (*Biologico*, 6 (1940), No. 6, pp. 144-148).—It is concluded that the disease in northeastern Brazil and the one in São Paulo are both due to a variety of *Fusarium orthoceras*.

Symptoms of potassium deficiency in carnation plants, A. J. SZENDEL (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), p. 1012, fig. 1).—The symptoms of K deficiency in plants grown in nutrient solution culture are described.

Certain mineral deficiency symptoms of gardenias grown in culture solutions, C. G. KEYES. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 1057, 1058).—The symptoms of deficiencies in Ca, K, Mg, and B experimentally induced in nutrient solutions are described.

Principles of disease control applicable to bulbous iris, F. P. McWHORTER (*Oregon Sta. Cir. Inform.* 221 (1940), pp. 5).—A practical discussion of mosaic, leaf spots caused by *Heterosporium* and *Myrothecium*, and bulb rots caused by bacteria and blue mold, including symptoms, methods of spread, and the most effective means for control thus far available, based on State and Federal research, which have proved to be of value in the hands of growers.

Spread of rose virus diseases, P. BRETHERLEY and F. F. SMITH (*Amer. Nurseryman*, 72 (1940), No. 1, pp. 5-8, figs. 6).—A general discussion of rose mosaic, yellow mosaics, and streak, their spread in the nursery, and suggestions for their control based on eliminating nursery practices found capable of spreading infection in budding operations.

The detrimental effect of walnut to rhododendrons and other ornamentals, P. P. PIBONE (*North. Nut Growers Assoc. Proc.*, 30 (1939), pp. 73, 74).—Notes on an interesting case of poisoning to *Rhododendron catachiense* by *Juglans nigra* in a New Jersey nursery and on a case of toxicity to various species in a commercial planting of perennials near a large black walnut in a fence row, with reference to similar observations by others where *Kalmia latifolia* and other rhododendrons had shown unfavorable responses when planted near walnut trees.

Notes on *Gymnosporangium cupressi*, W. H. LONG and L. N. GOODING (*Mycologia*, 32 (1940), No. 4, pp. 489-492, fig. 1).—The pycnial and aecial stages of this rust on *Amelanchier* are described.

Brown-spot (*Alternaria passiflorae* Simmonds): A disease of the passion-vine in New Zealand, R. M. BRIEN (*New Zeal. Jour. Sci. and Technol.*, 21 (1940), No. 5A, pp. 275A-279A, figs. 4).—A general study of this disease of *Passiflora edulis*.

An entomogenous fungus on spider mites on water hyacinth, V. K. CHARLES. (U. S. D. A.). (*Mycologia*, 32 (1940), No. 4, pp. 537-540).—*Rhizotrichum depauperatum* n. sp. on *Paratetranychus yotheri* on leaves of *Pistia stratiotes*.

Diseases of trees, L. R. TEHON (*Amer. Nurseryman*, 72 (1940), No. 1, p. 24).—Note on the virus leaf-casting yellows disease of peach reported in California.

Balloon releases and Dutch elm disease spread, E. P. FELT (*Bartlett Tree Res. Labs. Bul.* 3 (1939), pp. 20-25, figs. 4).—A continuation of the balloon work of 1936, previously reported (*E. S. R.*, 77, p. 648), indicates the possibility of a somewhat direct connection between the occurrence of the Dutch elm disease and the drifting of elm bark beetles considerable distances with the wind.

Notes on Gymnosporangium in Oklahoma, W. W. RAY (*Mycologia*, 32 (1940), No. 4, pp. 572-574).—Notes on species of this rust genus on *Juniperus* spp. in the State.

The plane tree disease, J. A. MILLER (*Bartlett Tree Res. Labs. Bul.* 3 (1939), p. 27).—A note calling attention to the spread and seriousness of this disease of the London plane tree due to a species of *Ceratostomella*.

Three new Hyphomycetes preying on free-living terricolous nematodes, C. DRECHSLER. (U. S. D. A.). (*Mycologia*, 32 (1940), No. 4, pp. 448-470, figs. 3).—*Dactyliella doedycoides*, *Dactylaria haptospora*, and *Tridentaria implicans* are all described as new species, illustrated, and their parasitic relations discussed. Corrections concerning *D. brochopaga* and *Arthrobotrys superba* are also included.

A simple ultrafiltration apparatus, T. B. COOLIDGE (*Jour. Biol. Chem.*, 135 (1940), No. 2, pp. 541, 542, fig. 1).—The membrane used for this ultrafiltration tube is Visking sausage casing, sold in 500-ft. rolls. This is soaked 20 min., knotted, invaginated, and filled as illustrated.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Work in economic zoology and entomology by the Indiana Station], G. A. FICHT, T. E. HENTON, W. B. CARTWRIGHT, C. BENTON, P. LUGENBILL, H. R. PAINTER, E. V. WALTER, D. W. LAHUE, G. E. GOULD, G. E. MARSHALL, J. J. DAVIS, B. E. MONTGOMERY, L. F. STEINER, J. E. FAHEY, and G. C. ODERKIRK. (Partly coop. U. S. D. A. et al.). (*Indiana Sta. Rpt.* 1939, pp. 18, 19, 71-77, 78-81, figs. 5).—The work of the year (*E. S. R.*, 81, p. 671) reported upon includes control of the mint flea beetle; European corn borer and its possible control by the use of electric traps; root nematode of tomatoes; cutworms and armyworms; gladiolus thrips; hessian fly; white grub, particularly *Phyllophaga hirticollis*; corn earworm; chinch bug; potato insects; Mexican bean beetle; cucumber beetle; cockroaches; codling moth control; oriental fruit moth; forest insects; and rodent control.

[Contributions on wildlife research and management] (*U. S. Dept. Int., Bur. Biol. Survey, Wildlife Leaflets* BS-141 (1939), pp. 1; BS-142, pp. 11; BS-143, pp. 4; BS-144, pp. 6; BS-145, pp. 5; BS-146, pp. [2]; BS-147, pp. 37; BS-148, pp. 10; BS-149, pp. 5, pl. 1; BS-150 (1940), pp. 7; BS-151, pp. 3; BS-152, pp. 5; BS-153, pp. 4, pl. 1; BS-154, pp. [2]+34, fig. 1; BS-155, pp. 2; BS-156, pp. 18; BS-157, pp. 4, pls. 2; BS-158, pp. 21, figs. 37; BS-159, pp. 6; BS-160, pp. 6; BS-161, pp. 5; BS-162, pp. 6; BS-163, pp. 2; BS-164, pp. 7; BS-165, pp. 22).—In continuation of this series (*E. S. R.*, 82, p. 214), the following are presented: Protecting Blueberries From Damage by Herring Gulls, by R. C. McClanahan (BS-141); Big-Game Inventory of the United States, 1938

(BS-142); Suggestions for the Control of Vagrant Domestic Pigeons (BS-143); Raising Deer in Captivity (BS-144); Birdbanding, by F. C. Lincoln (BS-145), which supersedes BS-53 (E. S. R., 76, p. 355); Lake Mattamuskeet Wildlife Refuge (BS-146); Abstract of Fur Laws, 1939-40, compiled by F. G. Grimes (BS-147); Status of the American Bison in the United States and Alaska, 1939 (BS-148); Protecting Field Crops From Waterfowl Damage by Means of Reflectors and Revolving Beacons, by F. M. Uhler and S. Creech (BS-149); Suggestions for Bird Field Study, by M. T. Cooke (BS-150); Raising Chinchillas in Captivity (BS-151); Suggested Action Program for Sportsmen's Organizations (BS-152); The Biological Survey Mammal Collection (BS-153); Flora of the Patuxent Research Refuge, Maryland, by N. Hotchkiss (BS-154), previously noted (E. S. R., 83, p. 597); Raising Mealworms, by F. H. May (BS-155); Ornamental Woody Plants Attractive to Birds, by M. Katz (BS-156); Sullys Hill National Game Preserve, North Dakota (BS-157), which supersedes BS-61 (E. S. R., 76, p. 355); Original and Present Breeding Ranges of Certain Game Birds in the United States, by R. C. McClanahan (BS-158); The Chukar and Hungarian Partridges in America, by C. Cottam, A. L. Nelson, and L. W. Saylor (BS-159); Wildlife in Land Planning (BS-160), which supersedes BS-71 (E. S. R., 77, p. 652), and Wildlife Technology (BS-161), both by W. L. McAtee; Birds as a Factor in Controlling Insect Depredations, by C. Cottam and F. M. Uhler (BS-162); Common Salt as a Curative for Cannibalism Among Game Birds in Captivity, by R. B. Nestler (BS-163); Research in the Administration of Federal Refuges, by E. R. Kalmbach (BS-164); and The Status of Migratory Game Birds, 1939-40 (BS-165).

Wildlife Review, [August 1939-August 1940] (U. S. Dept. Int., Bur. Biol. Survey, Wildlife Rev. Nos. 22 (1939), pp. 50; 23, pp. 35; 24, pp. 52; 25, pp. 22; 26 (1940), pp. 54; 27, pp. 41; 28, pp. 51).—A continuation of this series (E. S. R., 81, p. 537).

A game survey in northeastern Tennessee, L. WING. (Wash. State. Col.). (*Jour. Tenn. Acad. Sci.*, 15 (1940), No. 3, pp. 309-320).

Anesthesia of fur-bearing animals, W. WISNICKY. (Wis. Expt. Sta.). (*North Amer. Vet.*, 21 (1940), No. 5, pp. 277-280, figs. 6).

Check-list of birds of the world, IV, J. L. PETERS (Cambridge: Harvard Univ. Press., 1940, vol. 4, pp. XII+291).—This further volume (E. S. R., 77, p. 654) lists the birds of the orders Cuculiformes (plantain-eaters and cuckoos), Strigiformes (owls), Caprimulgiformes (oil-birds and goatsuckers), and Apodiformes (swifts and hummingbirds).

Natural history of the birds of eastern and central North America (Boston: Houghton Mifflin Co., 1939, pp. XXVI+554, pls. 97).—This revised and abridged single-volume edition, by J. B. May, of the earlier work by E. H. Forbush (E. S. R., 68, p. 635), includes more than 100 additional species. The 4 additional colored plates were prepared by R. T. Peterson.

A contribution to the herpetology of Florida, A. F. CARR, JR. (Fla. Univ. Pub., Biol. Sci. Ser., 3 (1940), No. 1, pp. [3]+118).—A brief introduction is followed by discussions of the derivation of the fauna of Florida and habitat distribution. A key for their identification and an annotated list of the forms occurring in the State, 162 in number, follow. Their Florida range, habitat, abundance, and habits are considered and a principal reference indicated. A bibliography of 7 pages and a subject index are included.

An introduction to nematology (Babylon, N. Y.: M. B. Chitwood, [1938], sect. 1, pts. 2, pp. [2]+55-123, figs. 58; [1940], 3, pp. [2]+125-204, figs. 35; sect. 2, pt. 1, pp. 205-240+[2], figs. 18).—In continuation of this work (E. S. R., 78, p. 814) part 2 of section 1, by B. G. and M. B. Chitwood, includes Cephalic Structures and Stoma (pp. 55-75), The Esophagus, including the Esophago-

intestinal Valve (pp. 76-99), The Intestine or Mesenteron (pp. 100-112), and The Posterior Gut (Structures of the Proctodeum) (pp. 113-122). Part 3 of section 1 includes The Excretory System, by M. B. and B. G. Chitwood (pp. 125-134); The Reproductive System (pp. 135-158) and Nervous System (pp. 159-174), both by B. G. and M. B. Chitwood; Nemic Ova, by R. O. Christenson, L. Jacobs, F. G. Wallace, and M. B. Chitwood (pp. 174-189); and Nemic Relationships, by B. G. Chitwood (pp. 190-204). Part 1 of section 2 includes Gametogenesis, by A. C. Walton (pp. 205-215); Nemic Embryology, by B. G. Chitwood (pp. 216-226); and Postembryonic Development, by M. B. Chitwood (pp. 227-240). A copious bibliography accompanies each of the several chapters.

A comparative study of the eggs of various species of nematodes parasitic in domestic ruminants, D. A. SHORR (U. S. D. A.). (*Jour. Parasitol.*, 26 (1940), No. 3, pp. 223-231, figs. 4).—The author has found that 15 genera of nematodes, the eggs of which occur in feces, have been reported in the United States as parasites of domestic ruminants. Eight of these genera are said to have more than 1 species represented in one or more of the common domestic ruminants. The species of these genera can be identified more or less definitely by differences in size and shape of their eggs. Precise identification is facilitated by host relationship and geographical distribution of the species considered.

Effect of tropical sunlight on eggs of *Ascaris suis* (Nematoda), the large intestinal roundworm of swine, L. A. SPINDLER (U. S. D. A.). (*Jour. Parasitol.*, 26 (1940), No. 4, pp. 323-331).—In reporting further (E. S. R., 76, p. 848; 77, p. 244), 14 tests upon undeveloped eggs of the swine ascarid in Puerto Rico, both in water and when dry, revealed that they were less resistant to the effects of sunlight than fully developed eggs. All the 1-celled eggs in water failed to survive continuous exposure to sunlight as long as 3 hr., and none survived 2¾ hours' exposure in a dried condition. Some embryonated eggs in water survived 5 hr. and some as long as 9 hr. Embryonated eggs exposed in a dried condition failed to survive exposure periods as long as 5 hr.

Euparyphium melis (Trematoda: Echinostomidae) from the snowshoe hare, A. B. ERICKSON. (Minn. Expt. Sta. et al.). (*Jour. Parasitol.*, 26 (1940), No. 4, p. 334).—*E. melis*, the adult of which is normally a parasite of the intestines and stomachs of minks, was found to be present in 1 of more than 600 snowshoe hares (*Lepus americanus phaeonotus*) collected in Morrison County, Minn.

Some helminth parasites of the Panama otter [*Lutra repanda*], A. MCINTOSH. (U. S. D. A.). (*Jour. Parasitol.*, 26 (1940), No. 3, pp. 219-222, figs. 6).

Studies on blood protozoa obtained from Mexican wild birds, R. HEWITT (*Jour. Parasitol.*, 26 (1940), No. 4, pp. 287-295, figs. 21).—Report is made of blood protozoa belonging to the genera *Plasmodium*, *Haemoproteus*, *Leucocytozoon*, and *Trypanosoma* from 3 species of wild birds obtained in the vicinity of Mexico City, including 61 common house finches (*Carpodacus mexicanus frontalis*), 30 *Molothrus* sp., and 3 cedar waxwings (*Bombicilla cedrorum*).

A catalogue of parasites of domestic animals from Formosa, M. SUGIMOTO ([Tokyo: Yoken-do], 1939, pp. [5]+244).—Part 1 of this catalog (pp. 1-81) is devoted to the Cestoda or tapeworm, 34 forms of which are recognized from Taiwan (Formosa), and part 2 (pp. 83-210) to roundworms, including the Nematoda and Acanthocephala. Arranged in systematic order, a quite complete synonymy is given for each form, together with a list of hosts, location, and distribution. A host list with their parasitic cestodes and roundworms, arranged in systematic order, follows (pp. 211-227). An index is included.

Money losses due to destructive insects, H. B. WEISS (*Jour. V. Y. Ent. Soc.*, 48 (1940), No. 2, pp. 195-199).

Insects and their rôle in Indian agriculture, T. V. R. AYYAR (*Indian Sci. Cong. Proc. [Lahore]*, 26 (1939), pt. 2, pp. 371-315, figs. 4).

Fluctuations in insect numbers, H. F. BARNES (6. *Cong. Internatl. Ent.*, Madrid, 1935, [I], Trabs., pp. 181-186, figs. 4).

Immunity and serotherapy of insects [trans. title], V. ZERNOFF (6. *Cong. Internatl. Ent.*, Madrid, 1935, [I], Trabs., pp. 153-161).

A discussion of the microbial flora of insects, E. A. STEINHAUS. (Ohio State Univ.). (*Jour. Bact.*, 40 (1940), No. 1, pp. 161, 162).—In a survey made of the extracellular bacterial flora of certain insects, 83 strains of bacteria, 2 of yeasts, and 2 of molds were isolated from 28 species. The insects examined included species from 7 orders of the class Hexapoda. Of the bacteria isolated, 45 were Gram-negative short rods, 14 were Gram-positive cocci, and 12 were Gram-positive spore formers. Based on cultural and physiologic characteristics, 31 new species were represented among the 83 strains. Twenty strains of the Gram-negative short rods were coliforms. The bacterial flora may differ in the various parts of the alimentary tract. Thus the large milkweed bug had a flora in its pylorum and rectum distinctly different from that in the 4 stomachs which precede them.

A survey of insecticide materials of vegetable origin, edited by H. J. HOLMAN (*London: Imp. Inst.*, 1940, pp. VIII+155).—This survey of alkaloid-containing materials (nicotine, etc.), plants containing rotenone and allied compounds, pyrethrum, quassia, and plant oils includes a list of 372 references to the literature and an appendix devoted to structural formulas.

Metallic salts and alkaloids in agriculture, R. HUTTON (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 1, p. 46).—This abstract of a résumé of the extent to which metallic salts and alkaloids are used in agriculture, particularly as insecticides, cites statistics on the increased use of arsenicals on crops during the last 20 yr. Statistics on annual consumption of insecticides and the probable effect upon the market for arsenicals of the introduction of plant insecticides, such as pyrethrum, nicotine, derris, and cube, are included. A list of 36 metallic salts and alkaloids other than those used in large quantities was added, indicating the constantly growing uses of poisonous materials for insect control. There was also included an evaluation of crop rotation, cultural methods, resistant varieties, and growth stage on the sale of insecticides.

Change in spray residue tolerance will aid apple and pear growers, S. W. HARMAN (*Farm Res. [New York State Sta.]* 6 (1940), No. 4, p. 6).—Attention is drawn to the advantages which fruit growers may expect from the recent changes in the Federal spray residue tolerance for lead and arsenic on apples and pears. Based on the results of a 3-yr. study made by the U. S. Public Health Service, the tolerance for lead has been increased from 0.025 to 0.05 gr. per pound of fruit and the tolerance for arsenic from 0.01 to 0.025 gr. of arsenic trioxide per pound of fruit. It is concluded that the average fruit grower should now be able to use lead arsenate for the first-brood codling moth worms with little danger of exceeding the tolerance. Although the second-brood or August sprays are likely to build up excessive deposits, by the use of lead arsenate substitutes now available growers should have little difficulty in selecting a satisfactory second-brood program. A table based upon work at the station in determining the spray residue deposits likely to be found on fruit at harvest from various spray schedules is included.

The wheat field survey for 1940, T. H. PARKS (*Ohio Sta. Bimo. Bul.* 206 (1940), pp. 147-150, figs. 3).—The annual wheat insect survey of 1940 (E. S. R..

82, p. 72) covering 34 counties of Ohio showed the hessian fly to be reduced to quite satisfactory numbers. The percentage of wheat straws found infested, namely, 4 percent, as compared with 20.5 percent in 1939, is indicated for the counties surveyed. The wheat jointworm was found present to about the same extent as in 1939.

Potato insect investigations in 1939, W. A. RAWLINS. (Cornell Univ.). (*Amer. Potato Jour.*, 17 (1940), No. 6, pp. 135-139).—A review, presented with a list of 30 references to the literature.

Resistance in wild potatoes to attack by the potato leafhopper and the potato flea beetle, J. P. SLEESMAN. (Ohio Expt. Sta.). (*Amer. Potato Jour.*, 17 (1940), No. 1, pp. 9-12).—A survey made of the potato leafhopper populations and the amount of feeding by the adult flea beetle on 12 species of *Solanum* at McGuffey, Ohio, is reported upon. The rate of mortality of leafhopper nymphs on 4 species of *Solanum* was determined in laboratory feeding tests, as was the amount of feeding by adult flea beetles on 2 species of *Solanum*, both in 1938. *S. polyadenium* was found to be highly resistant, if not immune, to attack by the potato leafhopper, as were the 3 closely related species *S. chacoense*, *S. commersonii*, and *S. caldasii*. *S. bulbocastanum* revealed fair resistance to flea beetle attack, while *S. polyadenium* was highly immune. Only slight feeding by the adult flea beetles occurred on the latter species.

[Contributions on economic insects attacking trees and shrubs and their control] (*Bartlett Tree Res. Labs. Bul.* 3 (1939), pp. 28-39, 40-43, figs. 2).—Contributions presented include Holly Leaf Miner (*Phytomyza ilicicola* Loew) (pp. 28, 29) and Dogwood Club Gall *Mycodiplosis alternata* Felt (pp. 30-33), both by E. P. Felt and S. W. Bromley; Rhododendron Whitefly *Dialeurodes chittendeni* Laing (p. 34) and A Rhododendron Midge, *Giaromyia rhododendri* Felt (p. 35), both by E. P. Felt; and Aphids of Coniferous Trees (pp. 36-39), Tests With Wetting Agents for Arsenate of Lead (pp. 40-42), and Colloidal Arsenates of Lead (pp. 42, 43), all by S. W. Bromley.

Protecting shade trees from insect damage, W. P. FLINT and M. D. FARRAR. (*Illinois Sta. Cir.* 509 (1940), pp. 60, figs. 36).—A practical summary in which insect enemies of the more important shade trees are considered.

The silverfish in a new role, R. E. SLABATGH. (Univ. Ill.). (*Ill. State. Acad. Sci. Trans.*, 32 (1939), No. 2, pp. 227, 228).—Report is made of the attack on rayon fabric, including curtains, knit underwear, and dresses, by the firebrat. This silverfish, unlike the true silverfish (*Lepisma saccharina*), flourishes in a temperature as high as 100° F. Its attack results in scraped areas or holes in the rayon fabric. An examination has shown rayon to be attractive, those fabrics containing sulfonated compounds varying in attractiveness with the amount of fatty material contained. Some of the finishing agents are also very eagerly sought and much more attractive than others. It is suggested that the pest be destroyed before increasing to injurious abundance; that it may be feasible to protect the fabric by the application of a protective proofing.

Summer sprays for control of the gladiolus thrips, E. I. McDANIEL (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 1, pp. 8, 9).—Brief reference is made to the results of experimental work and investigations of the gladiolus thrips by the U. S. D. A. Bureau of Entomology and Plant Quarantine and experiment stations which indicate that sprays using tartar emetic as the killing agent and brown sugar as the attractant are superior to other combinations. The author's experiments indicate that calcium antimony tartrate at the rate of 2 and 4 lb. plus 16 lb. of brown sugar per 100 gal. of water is nearly if not fully as effective as the tartar emetic formula recommended by the Bureau of Entomology and Plant Quarantine (E. S. R., 51, p. 242). "In 1939, both

tartar emetic and calcium antimony tartrate were checked on experimental plots at Michigan State College in comparison with (1) standard paris green, brown sugar formula, now in general use; (2) paris green 2 lb., brown sugar 64 lb., [and] water 100 gal.; and (3) for small dosages, 2 level tablespoonfuls paris green [and] 2 lb. brown sugar in 3 gal. of water. Better quality flowers, less injury to the foliage, together with from 10 to 15 percent more effective control of the gladiolus thrips, resulted from the use of either tartar emetic or calcium antimony tartrate than did the use of the paris green formula." Reference is also made to the value of nicotine, four applications of which, at intervals of from 48 to 72 hr., are required. Emphasis is placed upon the importance of cutting the tops of the corms as soon as possible, to prevent migration from wilting foliage thereto, and curing them in deep shade as far from the source of infestation as possible. They should be stored in a well-ventilated place at temperatures of 50°-40° F. through the winter and treated before planting to destroy any thrips that may remain.

A century of new American Thysanoptera, I, J. D. HOOD. (Cornell Univ.). (*Rev. Ent.*, 11 (1940), No. 1-2, pp. 540-583, fig. 1).—Descriptions are given of 10 new species from New York, 3 from Florida, and 1 each from Texas, Arizona, Cuba, and Peru.

Preliminary report on lubberly locust control, J. R. WATSON and H. E. BRATLEY (*Fla. Ent.*, 23 (1940), No. 1, p. 7-10).

Mitotic response of roach hemocytes to certain pathogens in the hemolymph, O. E. TAUBER. (Iowa State Col.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 1, pp. 113-119, figs. 2).

Six new South American Tingitidae (Hemiptera), C. J. DRAKE and M. E. POOR (*Rev. Ent.*, 11 (1940), No. 1-2, pp. 226-231).

A quantitative study of the periodical cicada with respect to soil of three forests, E. J. STRANDINE (*Amer. Midland Nat.*, 25 (1940), No. 1, pp. 177-183, figs. 5).

Peach aphids, M. L. BOBB. (Va. Expt. Sta.). (*Va. Fruit*, 28 (1940), No. 3, pp. 22, 25).

A study of the variation of size within two species of aphides, (I. H. L. DICKER and S. C. PEABCE (*Bul. Ent. Res.*, 31 (1940), No. 1, pp. 45-56, fig. 1).—Report is made of studies of *Macrosiphum rubicellum* Theob., a blackberry aphid, and *Aphis idari* van der Goot which infests raspberries.

The ecology of aphids in a subtropical climate, F. S. BODENHIMER (6. Cong. Internat. Ent., Madrid, 1935. [I], *Trab.*, pp. 49-58, figs. 2).

Life-history of *Pterochlorus persicae* (peach-stem aphid), A. S. TALWAR (*Indian Sci. Cong. Proc. [Lahore]*, 26 (1939), pt. 3, p. 140).

Biological control of prickly-pear in the Palu Valley (N. Celebes) [trans. title], P. VAN DER GOOT (*Landbouw [Buitenzorg]*, 16 (1940), No. 7, pp. 113-129, pls. 4, fig. 1; *Eng. abs.*, pp. 428, 429).—Report is made of the introduction, commenced in December 1934, of the mealybug *Dactylopius tomentosus* Lam. as a means of combating the pricklypear (*Opuntia nigricans* (= *O. dillenii*)). This pest had become increasingly harmful in the Palu Valley, the abandoned rice fields and grazing country being rapidly covered by a dense growth. The first results obtained were observed as early as May 1936. By the end of 1939 the cactus had disappeared everywhere, giving place to new growth of lamtoro (*Leucaena glauca*), with many fields again being tilled or used for grazing purposes.

A contribution to the study of *Pseudococcus comstocki* in Palestine, H. Z. KLEIN and J. PERZELAN (*Hadar*, 13 (1940), No. 4, pp. 107-110, figs. 3).—A study of the biology of Comstock's mealybug, which first came to attention

in Palestine in August 1937, as reported by Bodenheimer (E. S. R., 80, p. 797), and has spread over a large territory and seriously attacked many groves, is reported upon. It was found that under laboratory conditions this mealybug has seven annual generations, although in the grove in the coastal zone there seem to be six generations as a rule. The life cycle from oviposition to maturity of hatched females lasts from 5 to 6 weeks in summer and up to 3 mo. in winter, with the males requiring from 2 to 14 days less for development. All varieties of citrus are favorable host plants. The period of development on potato is similar to that observed on citrus. In cases of severe attacks nearly half of the seasonal crop was affected. In such cases there was no blossoming at all in the following season or only very limited blossoming.

Factors influencing the development and control of scale insects on citrus, W. L. THOMPSON. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 52 (1939), pp. 104-111).—Experimental work has shown the purple and red scales to develop more rapidly following inert residue- and fungicidal-sprays than when such sprays are omitted. Trees supplied with certain elements such as zinc and magnesium in addition to the regular fertilizer are more favorable to purple scale development because of the higher percentage of green leaves and increased foliage which remains on the tree longer. Oil emulsion sprays at a concentration of from 1.25 to 1.5 percent of oil applied against the purple scale proved more effective than sulfur sprays, although the latter when thoroughly applied from three to four times a year have held light infestations in check.

Black scale control, A. M. BOYCE, J. F. KAGY, G. L. MCCALL, and J. P. LADUE. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 25 (1940), No. 10, pp. 314, 342-344).—This is a summary of work with low dosages of oil with rotenone-bearing materials, the details of which are given in three tables. It appears that greater effectiveness from the toxic principles of rotenone-bearing root is obtained when these toxic principles are extracted from the root and solubilized with oil than when the powdered root containing the toxic principles as they occur naturally is used. It is pointed out that low dosages of oil with rotenone-bearing materials are more effective on larger-sized black scale than the full dosage of oil, i. e., 1½ percent, alone. "Practical usage of low dosage oil with rotenone-bearing materials has demonstrated that such materials are of value in citrus pest control. However, there are important limitations to the general usage of such materials which are well known to those dealing with pest control on citrus."

The sycamore scale [*Stomacoccus platani* Ferris] and its control, R. H. SMITH (*Calif. Cult.*, 87 (1940), No. 20, p. 544).

The life history of the peach borer (*Synanthedon exitiosa* Say) in Ontario, T. ARMSTRONG (*Sci. Agr.*, 20 (1940), No. 10, pp. 557-565, pls. 2, figs. 2).—Report is made of a 4-yr. study of the bionomics and control of the peach borer, which has become increasingly troublesome throughout the peach-growing areas of the Niagara Peninsula and western Ontario. Two hymenopterous parasites were reared in the Niagara district in 1937 from peach borer cocoons, namely, *Microbrachon sanninoideae* Gahan and *Phacognes ater* Cress, the parasitism in that year amounting to 2.5 percent.

Pecan foliage as food for the pecan nut casebearer (*Acrobasis caryae* Grote), S. O. HILL. (U. S. D. A.). (*Fla. Ent.*, 23 (1940), No. 2, pp. 27-29).—In experiments in which newly hatched larvae were placed on the under side of pecan leaflets they were found to consume the undersurface. Such larvae reared on leaves and twigs completed their growth in the same period as those reared on pecan nuts. The experiment explains to some extent why the pecan nut casebearer can survive in orchards when there are no nuts on the trees.

Observations of the tobacco budworm as an enemy of cotton in Peru [trans. title], J. E. WILLE (*Rev. Ent.*, 11 (1940), No. 1-2, pp. 585-588).

The use of electric light traps in the control of the European corn borer, G. A. FIGHT, T. E. HENTON, and J. M. FOLE. (Ind. Expt. Sta. and U. S. D. A.). (*Agr. Engin.*, 21 (1940), No. 3, pp. 87-89, figs. 2).—In preliminary studies of the attraction of electric light traps (E. S. R., 82, p. 78) for the European corn borer a total wattage of 2,000 per acre resulted in the almost complete elimination of borer infestation within the lighted area. Later work has led to a reduction in the number of lamps used per unit area, with consequent reduction in the cost of installation and operation. Several factors appear to influence the number of moths captured at various traps or to have a bearing on the flight of the corn borer adults to lights, the most important of which appear to be the height of the corn under or surrounding the traps, the distribution of the traps, the height of the traps above the corn, the position of the traps with regard to the prevailing winds, and the height of the traps with regard to the topography or contour of the lighted area. Such influences are not easily segregated into individual factors, since the moths have probably been influenced by a combination of factors. Of these, the height of the corn under or in the immediate vicinity of the traps is thought to be the greatest single factor determining the flight of moths to traps of equal light output.

An account of *Diatraea saccharalis* F., with special reference to its occurrence in Barbados, R. W. E. TUCKER (*Trop. Agr. [Trinidad]*, 17 (1940), No. 7, pp. 133-138).—Presented with a list of 25 references to the literature.

Preliminary experiments with lead arsenate and calcium arsenate in combating the cotton leaf worm [trans. title], B. T. SNIPES (*Rev. Ent.*, 11 (1940), No. 1-2, pp. 501-532, figs. 7; *Eng. abs.*, pp. 531, 532).—The highest degree of control of the cotton leaf worm was obtained by dusting with equal parts of lead arsenate and sulfur, although the results of dusting with calcium arsenate and spraying with a 0.5 percent calcium arsenate solution were not statistically less efficient. Spraying with lead arsenate at 0.5 percent gave less control, and a 0.25-percent concentration of this insecticide was not satisfactory against this pest.

Investigations on the cotton bollworm (*Heliothis armigera* Hübn. (obsoleta Fabr.)).—II, The incidence of parasites in quantitative relation to bollworm populations in South Africa, F. S. PARSONS (*Bul. Ent. Res.*, 31 (1940), No. 1, pp. 89-109, figs. 4).—This contribution is in continuation of that noted (E. S. R., 82, p. 800).

Scientific survey of Porto Rico and the Virgin Islands.—Vol. XII, pt. 2, Insects of Porto Rico and the Virgin Islands: Moths of the family Noctuidae, W. SCHAUS (*New York: N. Y. Acad. Sci.*, 1940, pp. [2]+177-290).—This second contribution (E. S. R., 67, p. 573) deals with the synonymy and habitat of the noctuid moths of Puerto Rico and gives technical descriptions of many of the forms. Three genera are erected and 16 species described as new.

Mosquito control: Practical methods for abatement of disease vectors and pests, W. B. HERMS and H. F. GRAY (*New York: Commonwealth Fund; London: Oxford Univ. Press.* 1940, pp. XII+317, figs. 60).—Following an introduction, the subject of mosquito control is dealt with under the headings of economic importance of mosquitoes (pp. 11-21); laws and agencies for mosquito abatement (pp. 22-47); preliminaries to abatement procedures (pp. 48-66); education of the public (pp. 67-84); finding mosquito breeding places (pp. 85-100); abatement methods—general principles (pp. 101-109); drainage and reclamation of fresh-water marshes (pp. 110-133) and of salt-water marshes (pp. 134-158); filling, pumping, and flushing (pp. 159-164); oils and larvicides (pp.

165-199); methods of application of oils and larvicides (pp. 200-220); mosquito control by use of fish (pp. 221-229); supplementary protective measures (pp. 230-245); special features of mosquito control in urban areas (pp. 246-259) and in rural areas (pp. 260-275); and species sanitation and naturalistic control (pp. 276-287). The principal malaria-transmitting anophelines of the world are listed, with their regions of malaria transmission and typical breeding places, in an appendix (pp. 289-293). Additional appendixes consider the suggestive associations of mosquitoes grouped according to typical larval habitats (p. 294), a classification of mosquito abatement methods (pp. 295-297), and a selected list of books and articles on mosquito species and biology (pp. 298-303).

A comparative evaluation of paris green and pyrethrum emulsion as anopheline larvicides in Georgia: A progress report, J. M. HENDERSON and R. S. HOWARD, JR. (*Amer. Jour. Trop. Med.*, 20 (1940), No. 4, pp. 585-592).—It is concluded from the work conducted that pyrethrum-oil emulsion is a "competent anopheline larvicide, the efficiency of which varies directly with its rate of application. Under the conditions of observation, the materials cost of pyrethrum larvicide was from 10 to 15 times that of the amount of paris green-lime mixture required to produce equivalent mortality. It is likely that non-materials costs would increase this economic differential in favor of the paris green. The pyrethrum killed or injured numerous invertebrate mosquito predators, while paris green did not appear to have this effect."

Oviposition experiments with anopheline mosquitoes, M. BATES (*Amer. Jour. Trop. Med.*, 20 (1940), No. 4, pp. 569-583).—Observation on the behavior of mosquitoes in the laboratory and the distribution of eggs in nature is said to have convinced the author that the Albanian *Anopheles*, especially species of the *maculipennis* group, normally oviposit while hovering over the water. Field observations are said to have shown that the differences "between the larval habitats of various species are largely the direct result of selection of oviposition site by the adult females. *A. atroparvus* in laboratory experiments showed a pronounced preference for dark background colors in ovipositing and for water containing calcium. It seemed to be more or less indifferent to the sodium chloride content of the water. Experiments and observations on time of oviposition gave conflicting results, but seem to indicate that oviposition may depend on a combination of stimuli rather than on some single factor in the daily cycle of environmental changes."

A preliminary survey of the anopheline mosquito fauna of southeastern Minnesota and adjacent Wisconsin areas, R. H. DAGGY, O. J. MURGE, and W. A. RILEY (*Minn. Med.*, 23 (1940), No. 8, pp. 556-564, figs. 3).

The relation between the amount of arsenic a fish gets from mosquito-control dusting and the lethal dose, E. M. MCCORMICK. (Ohio State Univ.). (*Jour. Tenn. Acad. Sci.*, 15 (1940), No. 3, pp. 342-351).—The tests reported do not show that arsenic from mosquito-control dusts is taken internally to any great extent by fish (*Gambusia* and catfish) in the wild. Fish experimentally exposed in the laboratory were thought to have died from factors other than arsenic poisoning.

The mosquitoes of Costa Rica, H. W. KUMM, W. H. W. KOMP, and H. RUTZ (*Amer. Jour. Trop. Med.*, 20 (1940), No. 3, p. 385-422, figs. 2).—A survey made of the mosquito population of Costa Rica, in which 14,961 adult mosquitoes and 9,743 larvae, representing 93 species, were examined, is reported upon.

The juniper midge *Contarinia juniperina* Felt, a pest of red cedars, R. L. PARKER and O. E. WENGER. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 13 (1940), No. 2, pp. 46-50, figs. 2).—The so-called juniper midge, the newly described species *C. juniperina* (E. S. R., 81, p. 682), is reported to have been a

source of injury to the terminal growth of red cedars in various localities of Kansas during the years 1935-39. Its injury was first attributed to winter drought or dry freezing of immature growth. A description of several stages of the insect and notes on its biology are given. The midge hibernates in the injured twigs or surface soil beneath infested trees. Soil fumigants, ethylene dichloride emulsion, dichloroethyl ether, and paradichlorobenzene, applied during the early spring to infested soil, either bare or covered with needles, gave effective control of such hibernating insects. Its natural enemies include an undescribed hymenopterous parasite of the genus *Platygaster*, great numbers of which were observed.

The gall midges attacking the seed-heads of cocksfoot (*Dactylis glomerata* L.), H. F. BARNES (*Bul. Ent. Res.*, 31 (1940), No. 1, pp. 111-119, pls. 2).—An account is given of four gall midges, the larvae of which damage the seed of cocksfoot grass, namely, *Contarinia dactylidis* (H. Lw.), *Dasyneura dactylidis* Metc., *Sitodiplosis dactylidis* n. sp. (described from England and Ireland), and *Stenodiplosis geniculati* Rent., a well-known pest of foxtail grass. A new variety, *S. geniculati dactylidis*, is described from cocksfoot in New Zealand. The occurrence of predaceous midges of the genus *Lestodiplosis* is also noted.

Two new pests of apple and black currant, H. F. BARNES (*Bul. Ent. Res.*, 31 (1940), No. 1, pp. 85-87, pl. 1).—The apple blossom midge *Contarinia mali* Barnes, recently reported as attacking apple blossoms and preventing fruit formation in Japan, and the black currant flower midge *Dasyneura ribis*, which attacks black currant flowers in Finland, are noted, the latter being described as new to science.

Three new western Simuliidae (Diptera), G. S. STAINS and G. F. KNOWLTON. (Utah Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 1, pp. 77-80, fig. 1).—Three species of bloodsucking flies collected in Utah, described as new to science, are *Simulium* (*Simulium*) *ticini*, *S. (Eusimulium) hardyi*, and *S. (Eusimulium) flaviantennus*.

New midwestern Dolichopodidae (Diptera), F. C. HARMSTON and G. F. KNOWLTON. (Utah Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 13 (1940), No. 2, pp. 58-61, figs. 9).—Three species of dolichopodids are described as new, namely, *Argyra similis* and *Rhaphium rossi* from Illinois and *Chrysotus chlanoflora* from North Dakota.

Tachytrechus studies (Dolichopodidae, Diptera), F. C. HARMSTON and G. F. KNOWLTON. (Utah Expt. Sta.). (*Canad. Ent.*, 72 (1940), No. 6, pp. 111-115, figs. 5).—A key is given to the males of North American *Tachytrechus*, and two species, *T. utahensis* from Utah and *T. tahocensis* from California, are described as new.

The Tabanidae of the Antilles (Dipt.), J. BEQUAERT (*Rev. Ent.*, 11 (1940), No. 1-2, pp. 253-269, figs. 34).—A revision of the dipteran family Tabanidae (horseflies, deer flies, etc.) of the Antillean region, the Caymans, Bahamas, and the Bermudas. Eleven new species are described.

The Sarcophaginae and their relatives in New York, I, H. C. HALLOCK. (Pa. State Col.). (*Jour. N. Y. Ent. Soc.*, 48 (1940), No. 2, pp. 127-153, figs. 97).—This account of the muscoid Diptera of the subfamily Sarcophaginae includes a key to the genera and a list of references to the literature.

Notes on Oklahoma bot flies, G. W. EDDY and K. C. EMERSON. (Okla. A. and M. Col.). (*Jour. Kans. Ent. Soc.*, 13 (1940), No. 2, pp. 44, 45).—Unpublished records of specimens of three species of Gasterophilidae (the horse botfly, the throat botfly, and *Gastrophilus incrimis* Brauer), the common cattle grub, and two Cuterebridae (*Cuterebra cuniculi* (Clark) and *C. (Bogeria) buccata* (Fab.)) are presented, together with observations of *C. (Bogeria) buccata*.

The medication of cattle for the control of horn flies, W. G. BRUCE. (U. S. D. A.). (*Jour. Kans. Ent. Soc.*, 13 (1940), No. 2, pp. 41-43).—This further contribution (E. S. R., 82, p. 362) summarizes the general results of 68 tests of 29 chemicals, in which 4 gave a 100 percent kill of the hornfly larvae in the droppings of cattle. Of these azobenzene, 2,4-dinitrophenylhydrazine, and phenothiazine are considered unsuitable for practical use. "The chemicals were administered by mouth, either mixed with the bran or in water or in a capsule. Rotenone was effective in much smaller doses than any other chemicals and had no apparent harmful effect on the animal. The minimum dose of rotenone that killed all hornfly larvae was 0.4 gm. per hundredweight. The droppings voided during a period of approximately 30 hr., beginning less than 10 hr. after administration of this dose, were rendered unfavorable for the development of hornfly larvae. The minimum effective dose is 0.3 gm. per hundredweight administered daily. A few flies emerged from droppings of cattle fed this dosage, but they were so small and weak that they probably would be unable to reproduce. . . . Phenothiazine was effective in doses as small as 1 gm. per hundredweight but had the undesirable quality of imparting red-dish tinge to the milk of cows. Furthermore, in doses of 2.25 gm. or more per hundredweight this chemical produced certain physiological disturbances as indicated by the loss of appetite, gaunt appearance, dullness of the eyes, and nervousness."

The prevention and treatment of blowfly strike in sheep.—Report No. 2, L. B. BULL ET AL. (*Austral. Council Sci. and Indus. Res. Pam.* 98 (1940), pp. [1]+45, figs. 19).—This second report (E. S. R., 69, p. 557) considers measures to reduce (1) inherent predisposition, (2) immediate susceptibility, and (3) fly abundance. The treatment of strike is briefly considered. A list is given of 27 references to the literature.

Further studies on *Rhagoletis pomonella* (Walsh), A. D. PICKETT and M. E. NEARY (*Sci. Agr.*, 20 (1940), No. 10, pp. 551-556).—In continuation of earlier studies of the apple or blueberry maggot by Pickett (E. S. R., 77, p. 666) the authors report experiments which have proved the progeny from a cross of apple and blueberry forms to be fertile. The progeny of a cross of hawthorn and apple flies also proved to be fertile. One pupa was obtained from 80 hawthorn flies confined on snowberry (*Symphoricarpos racemosus*), this being the only fruit other than apple (in which they oviposit quite readily and the larvae develop to maturity) that the authors have been able to induce the hawthorn flies to oviposit in. It is quite possible that the failure of the flies to oviposit in blueberry is due to their late emergence. The present and earlier findings published show that adults reared in apple possess a considerable amount of adaptability in respect to hosts, producing offspring which developed to the mature larval stage in blueberry, hawthorn, pear, plum, mountain-ash, snowberry, and sweet cherry. To these, tomato, sour cherry, and *Cornus amomum*, reported by Hall (E. S. R., 82, p. 647), should be added. It is considered quite likely that the pest can develop in the cranberry.

The seed-corn maggot, a pest of red cedar seedlings, B. H. WILFORD. (U. S. D. A.). (*Jour. Forestry*, 38 (1940), No. 8, pp. 658, 659).—Report is made of the finding of the seed-corn maggot's seriously injuring young seedlings of red cedar (*Juniperus virginiana* L.) in the Wilson County cedar nursery near Lebanon, Tenn., in 1938. Reported as infesting larch roots as early as 1918, and its presence noted in acorns and peach seedlings, it had not been recognized as causing serious injury to forest seedlings previous to 1938. Examinations of an infested cedar stem just below the ground line reveals one or more maggots

attacking the roots or boring through and beneath the thin bark of the stem. From their points of entry the maggots feed up the stem to a short distance above the ground and down into the roots. They eat the soft tissue beneath the bark, often leaving a slender woody core encased in lacerated bark. Rapid disintegration of damaged but undevoured soft parts of the roots and stems follows. "The shredded bark and damaged roots are distinguishing evidence of maggots feeding, even after the insects have matured and emerged. Where the lateral roots only are damaged and the tap root is uninjured, or only lightly injured, adventitious root buds develop. If conditions favorable for growth prevail, new roots are formed and some damaged plants recover." Attention is drawn to the damage to cedar seedlings by the generally unhealthy appearance of the extremely young plants. This is followed by wilting and yellowing of the stems at and above the ground line. "Preliminary tests indicate that satisfactory control can be obtained with miscible carbon disulfide applied to the soil when the maggots are feeding. The carbon disulfide (50-percent strength) should be diluted with water (1 qt. of the stock chemical to 50 gal.) and sprinkled evenly on the soil at the rate of 1 pt. per square foot of surface. The chemical apparently causes no injury to cedar seedlings."

New genera and species of lady-beetles related to *Serangium* Blackburn (Coleoptera: Coccinellidae), E. A. CHAPIN (*Jour. Wash. Acad. Sci.*, 30 (1940), No. 6, pp. 263-272, figs. 24).—The genera *Catana* and *Serangiella* are erected, and several species of economic importance, namely, *Delphastus nebulosus* from Puerto Rico, *D. collaris* from the Canal Zone, *C. clauseni* from Sumatra, Federated Malay States, and Cuba, *Serangium japonicum* from Japan and China, *S. comperi* from the Fiji Islands, and *S. bakeri*, *S. luzonicum* and *S. metasternalis* from the Philippine Islands, are described as new.

Bionomics of two coccinellids, *Adonia variegata* Goez. and *Brumus suturalis* F., predating on aphids, A. P. KAPUR (*Indian Sci. Cong. Proc.* [Lahore], 26 (1939), pt. 3, pp. 146, 147).

Preliminary report on wireworm investigations in the Everglades, J. W. WILSON. (Fla. Expt. Sta.). (*Fla. Ent.*, 23 (1940), No. 1, pp. 1-6).—In wireworm investigations in the Florida Everglades, *Melanotus communis* Gyll., the Gulf wireworm, *Glyphonyx recticollis* (Say.), *Aeolus dorsalis* Say., *Dolopius* sp., and *Conoderus* sp. were found present. *M. communis*, the species studied, is the source of severe injury to the four major crops of the area, namely, sugarcane, celery, peppers, and potatoes. Life history studies, commenced in April 1939, show that this species is capable of completing its life cycle in 1 year's time in south Florida, but all stages are likely to be found at any time during the year, and it is capable of surviving for long periods of time without moisture on the muck soil. The results of seedbed treatment with soil fumigants, the wireworm population in cover crop plots, and the increase in wireworm population after summer cover crop and fallow treatment are presented in tables.

A key to the species of Ptinidae occurring in dwellings and warehouses in Canada (Coleoptera), W. J. BROWN (*Canad. Ent.*, 72 (1940), No. 6, pp. 115-122).

Meal beetle larvae as intermediate hosts of the poultry tapeworm *Railletina cesticii*, G. W. LUTTERMOSER. (U. S. D. A.). (*Poultry Sci.*, 19 (1940), No. 3, pp. 177-179).—The author reports having successfully experimentally infested the larvae of the red flour beetle and the confused flour beetle with the common chicken tapeworm *R. cesticii*. "Pupae and adult insects developing from infected beetle larvae were also found to be infected with cysticercoids of *R. cesticii*. Evidence is presented to show that the process

of metamorphosis of the beetles from larvae to pupa, or pupa to adult, does not destroy all of the cysticeroids present. The larvae became infected when offered the gravid segments of *R. cesticillus* in the presence of either a large or a small amount of food, such as bran."

A comparative study of the larvae of six species of *Silpha* (Coleoptera, Silphidae), C. K. DORSEY. (Md. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 1, pp. 120-139, figs. 58).

Is our bee pasture changing? H. F. WILSON (*Amer. Bee Jour.*, 80 (1940), No. 6, p. 260, figs. 2).

A new species of *Pseudogonatopus* (Hymenoptera: Dryinidae), H. E. BROWN. (Univ. Mo.). (*Ent. News*, 51 (1940), No. 1, pp. 10, 11, fig. 1).—Under the name *P. magnus*, a description is given of a new dryinid from Indiana which, because of its large size, is thought to be a parasite of the larger fulgorids.

Do *Habrobracon* females sting their eggs? A. R. WHITING (*Amer. Nat.*, 74 (1940), No. 754, pp. 468-471).—The studies reported led to the conclusion that either (1) females sting eggs very rarely or (2) stung eggs can continue development after such injury, and (3) that normal cleavage and even blastoderm formation are no indication of ultimate hatching.

Studies on the Ichneumonidae of New England (Hymenoptera).—I, The external morphology of *Arotes amoenus* Cresson, H. D. PRATT (*Jour. N. Y. Ent. Soc.*, 48 (1940), No. 2, pp. 155-193, figs. 19).—The external morphology of *A. amoenus*, one of the larger and more primitive of the ichneumon flies and common throughout New England, is reported upon.

The African species of *Metaphycus* Mercet, H. COMPERE. (Calif. Citrus Expt. Sta.). (*Bul. Ent. Res.*, 31 (1940), No. 1, pp. 7-33, figs. 4).—Seventeen of the 23 recognized African species of Hymenoptera of the parasitic genus *Metaphycus* are described as new.

The introduction of an indigenous blowfly parasite *Alysia ridibunda* Say into Uvalde County, Texas, A. W. LINDQUIST. (U. S. D. A.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 1, pp. 103-112).—Studies of the blowfly braconid parasite *A. ridibunda*, discovered by the author in southern Arizona and New Mexico and recorded in 1932 (*E. S. R.*, 67, p. 538), and known to occur generally over the eastern portions of the United States and in parts of Canada, are reported. Laboratory rearing revealed the duration of the immature stages to be from 19 to 350 days. Reared in the laboratory, a total of 50,221 adults were released in Uvalde County in the fall of 1934 and the spring of 1935. By July 1, 1935, it had "built up a tremendous population and was found on practically every carcass and small piece of carrion. The parasitization of blowfly larvae by *A. ridibunda* ranged up to 100 percent, with an average of 37.1 percent from April 1 to September 21, as indicated by exposure in pint jars of 4-oz. meat baits infested with blowfly larvae. During 1936 the parasite diminished greatly in numbers, in 1937 only two specimens were seen, and in 1938 only three were observed. In 1935 the parasite emerged from 80.9 percent of *Sarcophaga* larvae and from 10.4 percent of the *Lucilia* larvae collected in the field in that year. This indicated that *Sarcophaga* was a preferred host. No emergence occurred from other species of blowfly larvae. The parasite oviposited on larvae of the [secondary] screwworm *Cochliomyia americana* in the laboratory, but both host and parasite succumbed. The examination of approximately 300 cases of myiasis in domestic animals failed to reveal the parasite working on larvae in wounds, but adults oviposited in larvae of *C. americana* in wounds on guinea pigs in the laboratory and both the host and parasite larvae died. Dispersion from the release area in 1935-36 proceeded farther west-

ward than in other directions and greater numbers occurred in that direction. The point of recovery farthest from the point of release was 27 miles to the west. The causes for the remarkable increase in the population of *A. ridibunda* shortly after its release and the subsequent marked decrease are not fully understood."

Host selection by hymenopterous parasites of the moth *Plutella maculipennis* Curtis. D. C. LLOYD (*Roy. Soc. [London], Proc., Ser. B.* 128 (1940), No. 853, pp. 451-484, pls. 2, fig. 1).—An investigation being made of the incidence in the laboratory and field of superparasitism and multiparasitism in the primary parasites of the diamondback moth, dealing mainly with *Diadromus collaris* Grav., *Angitia cerophaga* Grav., and *Apanteles plutellae* Kurdj., is reported upon. A list of 21 references to the literature is included.

The life-history and morphology of *Euderus livida* (Ashmead), a larval parasite of the tur-pod fly *Agromyza obtusa*, T. AHMAD (*Indian Sci. Cong. Proc. [Lahore]*, 26 (1939), pt. 3, pp. 140, 141).

Hymenopterous parasites of willow insects, E. M. CALLAN (*Bul. Ent. Res.*, 31 (1940), No. 1, pp. 35-44, figs. 2).—Eight Ichneumonoidae, 14 Chalcidoidea, and 6 Proctotrupoidea are recorded as parasites of willow-infesting insects. The majority of records are of parasites reared from insects inhabiting the wood of the cricket-bat willow (*Salix alba caerulea*), "the more important being *Torymus pulchellus* Thoms., *Tridymus salicis* Nees, *Euphymus urozonus* Dalm., *Microcryptus clavellatus* Dalm., *Tetrastichus roesellae* DeG., *T. inunctus* Nees, *T. flavovarialis* Nees, *T. ? acuminatus* Ratz. and *Platygaster* sp. *M. clavellatus* is recorded for the first time as a parasite of Cecidomyiidae. Evidence is given for the separation of the gall midges *Rhabdophaga* sp. and *R. saliciperda* Duf. as distinct species, based both on structural differences and on a study of their parasites, for the three parasites found most commonly attacking *Rhabdophaga* sp. were never bred from *R. saliciperda*, and the most common species parasitizing *R. saliciperda* was never obtained from *Rhabdophaga* sp. It is confirmed that *Eurytoma salicis* Thoms. supplements its animal diet with vegetable food. The rate of parasitism of *Euura atra* Jur. by *Eurytoma salicis* is given as 19.8 percent and that of *Rhabdophaga* sp. by *Platygaster* sp. as 40.5 percent. Histograms are given of *Rhabdophaga* sp. and its parasites *Torymus pulchellus*, *Tetrastichus roesellae*, and *Platygaster* sp., the emergence of *Platygaster* sp. coinciding approximately with that of its host. Histograms are given of *Euura atra* and its parasite *Eurytoma salicis*, the emergence of which did not start until that of its host was practically complete."

Biological notes on Indian parasitic Chalcidoidea, H. S. PRUTHI and M. S. MANY (*Imp. Council Agr. Res. [India]. Misc. Bul.* 36 (1940), pp. [1]+44, pls. 22).—In this commencement of a series of biological notes in which Chalcidoidea are dealt with, it is stated that about 450 parasitic species have been recorded thus far from India, of which, in the case of about 175, hosts are known and described in this bulletin. It is pointed out that certain families of the tribe, including Agaonidae, Torymidae (part), and Eurytomidae (part), etc., are phytophagous and are not dealt with. A host-parasite index, arranged by orders, a list of references, and an index to the parasites are included.

The black wheat-stem sawfly, J. S. HOUSER (*Ohio Sta. Bmo. Bul.* 266 (1940), p. 151, fig. 1).—Observations in 1940 of the black wheat-stem sawfly (E. S. R., 80, p. 226), first discovered in the wheatfields of eastern Ohio in 1934, revealed but little advance in its spread westward. There was a sharp decline in the intensity of infestation, particularly in the older territory, as evidenced by the 1-percent infestations recorded in the counties of Mahoning,

Columbiana, and Carroll, where in 1936 in the first mentioned there had been an infestation of 65 percent of all wheat examined and in the latter 2 an infestation of 68 percent. The percentage of wheat infested in the 15 counties surveyed is indicated on an accompanying map.

A "ticktorium" for the propagation of a colony of infected *Ornithodoros turicata*, V. T. SCHUHARDT (*Jour. Parasitol.*, 26 (1940), No. 3, pp. 201-206, figs. 4).

ANIMAL PRODUCTION

[Animal production and poultry studies in the Southern States] (*Assoc. South. Agr. Workers Proc.*, 41 (1940), pp. 88-94, 94-101, 104, 105, 108-110, 210-212, 213-219).—Abstracts of the following papers presented at Birmingham, Ala., February 7-9, 1940, are included: Grass-Fed or Grain-Fed Beef—What's the Difference, by R. E. Hunt (Va. Expt. Sta.); Year-Round Grazing and Hogging-off Program for Hogs, by B. L. Southwell (Ga. Coastal Plain Sta.); Harvesting Crops With Livestock in the South, by C. I. Bray (La. Sta.); Roughage Problems With Special Emphasis on Quality, by E. O. Pollock, and Hay Problems With Emphasis on Quality, by A. D. Harlan (both U. S. D. A.); The Horse and Mule Outlook, by M. P. Jarnagin (Univ. Ga.); How Can the Small Farmer Be Induced to Become Feed Conscious and Livestock Minded? by R. S. Sugg; "Livestock Wintering Problems," by G. W. Barnes (Tex. A. and M. Col.); The Influence of Corriedale, Southdown, and Hampshire Breeding in Lamb and Wool Production, by H. H. Leveck (Miss. State Col.); Curing, Care, and the Storage of Meat on the Farm, by J. B. Francioni, Jr. (La. State Univ.); Poisonous Plants as a Problem in Southern Livestock Production, by E. V. Smith (Ala. Sta.); Microscopical Analysis and Effective Feed Control, by D. S. Coltrane; Fats in the Dairy Ration, by G. H. Wise (S. C. Sta.); Mineral Matter in Mixed Dairy Feeds, by P. T. D. Arnold and R. B. Becker (Fla. Sta.); "Value of Poultry Houses," by D. F. King, and Summer Green Feeds for Poultry, by G. J. Cottier (both Ala. Polytech. Inst.); The Effect of Feeding Upon the Interior Quality and Hatchability of Eggs, by H. J. Davis, and The Hatcheryman—A Key to Improved Poultry in the South, by C. W. Upp (both La. State Univ.); Alabama Poultry Improvement Project, by R. B. Jones; How a Certified Hatchery Can Improve the Quality of Poultry on Southern Farms, by P. A. Raper; Florida Poultry Problems, by D. F. Sowell; Georgia Poultry Problems, by A. Gannon (Univ. Ga.); Important Poultry Problems in Kentucky, by W. M. Insko, Jr. (Univ. Ky.); Poultry Problems in Mississippi, by G. R. Sipe (Miss. State Col.); Poultry Problems in South Carolina, by P. H. Gooding; and Important Poultry Problems of Arkansas, by R. M. Smith (Univ. Ark.).

[Livestock investigations in Indiana] (*Indiana Sta. Rpt.* 1939, pp. 10, 11, 15, 16, 23, 29, 38, 51-54, 102, 103, 104, 105).—In addition to a brief recital of outstanding research accomplishments in animal and poultry husbandry during the preceding decade, and notes on the calcium-phosphorus ratio for chicks and swine, meat meals for swine, and ground soybeans for calves, progress results are presented for the following lines of investigation: The value of mixed shelled corn and ground ear corn for fattening calves, cottonseed meal v. soybean oil meal for calves, the effect of varying the level of soybean oil meal as supplement to rations for fattening calves, the value of corn silage in the fattening ration, and the relative returns secured from the fattening of spring and fall calves, all by F. G. King; the need of legume hay in the winter ration of breeding ewes, the value of lime and protein supplements to

nonleguminous roughage for ewes, deleterious effect of iodine supplement in lamb rations, and long v. cut legume hay for fattening lambs, all by C. Harper; the effect of hominy feed on the quality of pork, nutritive value and mineral deficiencies of soybeans and soybean products for swine, and the effect of different kinds of fat in the ration on the character of fat formed in the hog, all by C. L. Shrewsbury and C. M. Vestal; comparison of protein mixtures for growing and fattening hogs and for brood sows, by Vestal; the vitamin A activity of carotene in different vegetable fats, by H. R. Kraybill, Shrewsbury, and F. P. Zschelle; and the influence of the ration on which hogs were fattened and the influence of type and finish on carcass and product grades, by J. R. Wiley.

From investigations with poultry, results are noted on the effect of ultra-violet irradiation on growth of chicks, by R. E. Roberts, T. E. Hinton, and J. M. Fore; the utilization of fat by chickens, by D. Whitson, S. M. Hauge, C. W. Carrick, and Roberts; alfalfa leaf meal as a substitute for wheat by-products in broiler rations, by Roberts and Carrick; the use of dried skim milk and of soybean products in laying rations, and the value of electric lights for turkeys, all by Carrick; and starting and growing rations for turkeys, by Roberts.

Reactions of animals to environmental temperature, humidity, and air movement, S. BRADY. (Mo. Expt. Sta.). (*Agr. Engin.*, 21 (1940), No. 7, pp. 265-268, figs. 9).—A discussion of the thermoregulatory mechanism of sweating and nonsweating species of animals and the response of members of these respective species to varying atmospheric conditions.

Importance of quality of protein, L. C. NORRIS. (Cornell Univ.). (*Flour & Feed*, 41 (1940), No. 4, pp. 5, 6, 30, 31, 33).—A general discussion, including data on the amino acid composition and the biological value of numerous feed proteins.

The riboflavin content of certain hays and grasses, C. H. HUNT and R. M. BERTHE. (Ohio Expt. Sta.). (*Jour. Nutr.*, 20 (1940), No. 2, pp. 175-180).—Employing the rat-growth bio-assay technic, samples of the oat plant, the wheat plant, and bluegrass, representing one stage of maturity, and samples of alfalfa and timothy, representing two stages of maturity, were assayed for riboflavin content. The oat plant cut at the 10-in. growth stage and cured in subdued light was highest in riboflavin, with an estimated content of 26 μ g. per gram, followed by wheat (10-12-in. height) 17, timothy (before heading) 17, alfalfa (before bloom) 16, alfalfa (beginning to bloom) 12, timothy (in head before bloom) 12, and bluegrass (beginning to head) 10. Alfalfa exposed to strong sunlight for 48 hr. after cutting lost approximately 25 percent of its riboflavin content.

Chemical changes in phosphoric acid silage, E. PAGE and L. A. MAYNARD. (Cornell Univ.). (*Indus. and Engin. Chem.*, 32 (1940), No. 8, pp. 1140-1143, figs. 2).—A mixed crop, consisting of 62.2 percent clover, 19.8 alfalfa, 16.2 grasses, and 1.8 percent weeds, was ensiled in a tower silo 12 ft. in diameter. Phosphoric acid was added at varying rates to layers of the green material, the layers being separated by waterproof rubber sheets. Layers 1 to 7 (order of filling) received 20, 16, 8, 0, 16, 8, and 20 lb. of phosphoric acid per ton, but contained, as analyzed, 24, 11, 7, 0, 15, 9, and 20 lb. per ton, while the pH of the outgoing silage was 3.73, 4.05, 4.1, 4.23, 4.2, 4.46, and 4.3, respectively. Silage of good odor and appearance resulted in each instance. Of the two layers which received the same amount of acid, the lower one of each pair had a lower pH and contained less ammonia and more lactic acid, indicating that layers under higher pressure attained an anaerobic condition more rapidly than

the upper ones. The layer receiving no acid contained the highest amount of ammonia, despite its relatively high lactic acid content. From the data obtained on nitrogen distribution, volatile acid content, and residual acidity, it is concluded that while phosphoric acid is of definite value as a preservative its action must be supplemented by a strong lactic acid production for best results.

Commercial feeding stuffs—report on inspection, 1939, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul. 436 (1940), pp. 349-450*).—This is the usual report of the guaranteed and found analyses of 849 samples of feeding stuffs collected for official inspection during the calendar year 1939 (E. S. R., 81, p. 691); assays of 45 vitamin D carriers, by R. B. Hubbell and Bailey; and 89 samples examined for poisons, by C. E. Shepard and Bailey.

Commercial feeding stuffs, H. R. KRAYBILL ET AL. (*Indiana Sta. Cir. 255 (1940), pp. 42, fig. 1*).—This circular presents the 1939 report (E. S. R., 81, p. 825) on registration and analyses of 3,380 samples of commercial feeding stuffs, together with information concerning the State law and regulations, suggestions for purchasers, official definitions of feeding-stuff ingredients, etc.

The adsorption of the vitamin A suppressing factor from soybean oil, S. M. HAUGE, J. H. HILTON, and J. W. WILBUR. (*Ind. Expt. Sta.*). (*Jour. Dairy Sci.*, 23 (1940), No. 8, pp. 719-723).—In an effort to remove the vitamin A-suppressing factor from crude soybean oil (E. S. R., 77, p. 388) it was treated with two adsorbents, one of which, Nuchar, removed the factor from the oil by adsorption rather than inactivation, while the other, a special sodium aluminum silicate compound, was without effect. It was not possible to elute with acetone the active principle adsorbed on Nuchar.

Experimental studies on diets deficient in vitamin B and their influence on the intestinal yeast flora of animals, I. FROILANO DE MELLO (*Indian Acad. Sci. Proc.*, 11 (1940), No. 6, Sect. B, pp. 225-235).—White rats, hens, rabbits, and pigeons were each confined to a diet of polished rice until symptoms of B avitaminosis occurred. Under such feeding regime the number of intestinal yeasts markedly increased and continued to increase as the animals became weaker. After return to normal feeding the yeast infestation gradually decreased to the level of the normal stage of health.

Phosphorus metabolism in the musculature of dystrophic vitamin E-deficient rats, G. D. LU, G. A. EMERSON, and H. M. EVANS. (*Univ. Calif.*). (*Amer. Jour. Physiol.*, 129 (1940), No. 2, p. P408).—Chemical studies were made of the musculature of a hind limb of 11 adult rats rendered dystrophic from vitamin E deficiency and also of that of 7 normally fed animals. The affected musculature showed slightly less inorganic phosphorus, no change in creatine phosphate, and a marked decrease in total acid-soluble phosphate and in total phosphorus. The ratio of creatine-phosphate-phosphorus to total acid-soluble phosphorus was increased. A marked decrease in the ability of the affected musculature to phosphorylate glycogen was apparent.

Pasture studies.—XVII, The relative ability of steers and rabbits to digest pasture herbage, E. W. CRAMPTON, J. A. CAMPBELL, and E. H. LANGE (*Sci. Agr.*, 20 (1940), No. 9, pp. 504-509).—Continuing these investigations (E. S. R., 83, p. 383), the results of four comparisons of the digestibility of dried pasture herbage clippings by steers and by rabbits are summarized. The rabbits digested dry matter only 71 to 85 percent as efficiently as the steers and their digestion coefficient were lower for every nutrient. Ratios between digestion coefficients for each fraction and dry matter digestibility indicated that, relatively, rabbits digested the crude protein of their diets consistently better, and crude fiber, total carbohydrates, cellulose, and lignin or organic matter less efficiently than did the steers. It is concluded that the digestibility of carbohydrate fractions isolated by the present feeding stuffs analysis is not predictable for one

species from the behavior of the other. Methods by which the rabbit might be successfully used as a pilot animal in pasture studies are discussed.

The composition and nutritive value, when fed to ruminants, of pea-pod meal and broad-bean-pod meal, H. E. WOODMAN and R. E. EVANS (*Jour. Agr. Sci. [England]*, 30 (1940), No. 2, pp. 189-201).—Data are presented on the chemical composition of pea pod meal and broad bean pod meal prepared from the artificially dehydrated pods and the digestion coefficients of these two products obtained by digestion trials with sheep. On a dry-matter basis the pea pod meal and bean pod meal, respectively, contained 10.82 and 11.17 percent digestible crude protein, 0.94 and 0.62 percent digestible ether extract, 46.12 and 44.81 percent digestible nitrogen-free extract, and 10.63 and 10.37 percent digestible crude fiber, with starch equivalents of 60.94 and 59.53. Both products are considered desirable constituents in the rations of sheep and cattle.

Wheat to meat is hard to beat, D. E. RICHARDS. (Oreg. Expt. Sta.). (*Last. Oreg. Wheat League Proc.*, 12 (1939), pp. 22-27).—A general discussion of the value of wheat for sheep, cattle, and swine under eastern Oregon conditions.

Calcium and phosphorus deficiencies in cattle and horses: Clinical picture, treatment, and prevention, H. SCHMIDT. (Tex. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.* 96 (1940), No. 757, pp. 141-158, fig. 1).—A review, with 74 references.

The influence of atmospheric temperature upon haemoglobin and other constituents of the blood of cattle, M. MANRESA, N. C. REYES, F. GOMEZ, L. P. ZIALCITA, and P. R. FALCON (*Empire Jour. Expt. Agr.*, 8 (1940), No. 30, pp. 97-100).—An investigation by the University of the Philippines with Indian Nellore cattle revealed a negative correlation between the hemoglobin index of blood and atmospheric temperature. In an intensive study of the blood of purebred Holstein, pure Indian Nellore, and F₁ Holstein × Nellore crossbreds, it was found that the hemoglobin content, red blood cell count, specific gravity of the blood, and phosphorus-calcium ratios in the blood serum bore a direct positive correlation to the ability of the animals to adapt themselves to existing temperature conditions, while uric acid, serum phosphate, and size of red blood cells were inversely related to adaptability. It is concluded that temperature is the most important limiting factor in the Philippines in the raising of cattle and also other classes of animals imported from temperate countries, and that success with such animals is almost impossible.

Bionomic studies on indigenous and exogenous cattle in the semi-arid regions of the Union of South Africa, J. H. R. BISSCHOP (*Empire Jour. Expt. Agr.*, 8 (1940), No. 30, pp. 138-147).—Since 1925 an experiment has been in progress in which foundation groups of indigenous nondescript cows and heifers have been systematically graded up with purebred Africander, Friesian, Red Poll, and Sussex bulls, respectively, representing the indigenous, dairy, dual-purpose, and beef types of cattle. At present the herd consists mainly of $\frac{7}{8}$ - and $\frac{15}{16}$ -bred animals. Data on prevailing environmental conditions, body conformation, milk and beef production, and reproduction of the experimental groups, and the characteristics of their blood, skin, and hair are each briefly summarized. The indigenous grades have maintained themselves phenotypically for three generations, but comparable groups of exogenous grades have failed to do so.

The comparative digestive powers of zebu and high-grade European cattle, M. H. FRENCH (*Jour. Agr. Sci. [England]*, 30 (1940), No. 3, pp. 503-510).—This report from the veterinary laboratory, Tanganyika Territory, indicates no significant difference in the ability of zebu cattle and grade (zebu × Ayrshire) cattle to digest native feeding stuffs.

A comparison of shelled corn, ground shelled corn, and ground snapped corn for winter-finishing baby beesves, M. JACOB, H. R. DUNCAN, L. R. NEEL, and B. P. HAZLEWOOD (*Tennessee Sta. Cir. 69 (1940), pp. 4, fig. 1*).—A summary is presented for six trials comparing shelled corn, ground shelled corn, and ground snapped corn, each fed with cottonseed meal, alfalfa, or mixed hay, and corn or sorghum silage for the winter finishing of baby beesves. Average daily gains of 1.8, 1.85, and 1.68 lb. per head and net profits per bushel of corn fed of 43, 36, and 42 ct. were obtained on the shelled corn, ground shelled corn, and ground snapped corn rations, respectively. Satisfactory slaughter calves were produced on each of the rations over a 180-day feeding period. Much larger pork gains per steer were secured on the shelled corn ration. It is suggested that machinery available, costs of the various operations, and the relative price of hogs and cattle should be the governing factors in choosing between shelled corn and ground snapped corn.

Studies on the total ketone bodies, sugar, and calcium of the blood of nonpregnant, nonlactating ewes, J. SAMPSON and L. E. BOLEY. (*Univ. Ill.*). (*Jour. Amer. Vet. Med. Assoc.*, 96 (1940), No. 757, pp. 480-485, figs. 2).—Analyses of blood samples collected at intervals during the day from nonpregnant, nonlactating ewes failed to reveal any appreciable diurnal variations in the total ketone bodies, sugar, or calcium of the blood. Neither moderate nor vigorous exercise affected the blood calcium level, but the former caused a slight increase and the latter a very pronounced increase in blood sugar. Fasts of 7 or 8 days' duration produced a definite decrease in blood sugar, no change in blood calcium, and an appreciable increase in total ketone bodies. A characteristic listlessness occurred in all ewes during the latter part of these fasting periods. Varying the ration and the level of feed intake over short periods significantly influenced the blood sugar level but did not appreciably change the serum calcium or concentration of ketone bodies.

Record of performance in sheep, C. L. COLE (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 1, pp. 6-8).—A study of the gross income from individual ewes representing four breeds, computed by taking the value of the lambs at 135 days of age plus the value of 12 months' growth of wool, showed a wide range between individuals within each of the breeds but only small differences between the averages for the four breeds. Low and high gross incomes were for Hampshires \$6.45-\$18.18, Oxfords \$9.49-\$16.56, Rambouillets \$8.07-\$16.18, and Shropshires \$8.15-\$15.63. There was a great difference in the growth rate of lambs within breeds and also in the degree of finish of lambs at 135 days of age. These results emphasize the need of greater attention to the actual production performance of individuals making up the breeding flock.

Corriedale sheep: The dual-purpose breed, F. S. HUIZZ (*Laramie, Wyo.: Amer. Corriedale Assoc.*, [1940], pp. 123, [figs. 23]).—A brief history, with particular reference to the development of this breed of sheep in the United States since the first importations in 1914.

Comparative value of corn, oats, and barley in fattening lambs, H. M. BRIGGS. (*Okla. Expt. Sta.*). (*Southwest. Sheep and Goat Raiser*, 10 (1940), No. 2, p. 28).—In a feeding trial of 100 days' duration in which feed intake was controlled to permit approximately equal gains in all groups of lambs, shelled corn, whole oats, whole barley, and mixtures of corn and oats, corn and barley, and oats and barley were compared. All groups received equal amounts of cottonseed cake and alfalfa hay. Oats and barley had values of 96.6 and 92.4 percent, respectively, that of corn when each was fed singly. When fed to replace one-half of the corn, oats and barley had values of 89 and 72.1 percent, respectively, that of the corn replaced. A mixture of oats and barley was slightly

more valuable than the combination of corn and barley. Lambs fed corn as the only grain yielded the highest and those fed barley the lowest grading carcasses.

Co-ordinated experiments in pig husbandry, R. W. SHORROCK (*Empire Jour. Expt. Agr.*, 8 (1940), No. 30, pp. 159-167).—A coordinated experimental program involving most of the several research centers of the British Isles, is described.

The relation of environmental conditions to breeding and selection for commercial types in pigs, C. P. McMEKAN and J. HAMMOND (*Empire Jour. Expt. Agr.*, 8 (1940), No. 29, pp. 6-10, pls. 2, fig. 1).—A discussion and summary of research previously noted (E. S. R., 82, p. 235).

Swine production in the South, B. L. SOUTHWELL, J. T. WHEELER, and A. O. DUNCAN (*Danville, Ill.: Interstate, 1940, pp. 307+[3], figs. 98*).—This treatise is intended primarily as a text for pupils enrolled in the courses in vocational agriculture in the South.

Meat meal for pigs, P. C. ANGOVE (*Jour. Dept. Agr. So. Austral.*, 3 (1940), No. 11, pp. 791-797).—In the pig feeding test reported 5 percent of digested meat refuse (36 percent protein) and 5, 7.5, and 10 percent of meat meal (66 percent protein) were fed as supplements to crushed barley plus a limited amount of green feed for fattening bacon pigs. Average daily gains of 1.2, 1.28, 1.33, and 1.38 lb. per head were secured through use of these respective supplements as compared with 1.10 lb. when no protein supplement was fed. Minimum feed requirement per pound of gain occurred with the 5 percent of meat meal in the ration, following in descending order by 7.5 and 10 percent of this product, 5 percent of meat refuse, and no supplement. The high value of these packing-house byproducts as supplements to barley for bacon pig production is clearly demonstrated.

Carcass studies on some grain-fed and garbage-fed hogs, E. H. HUGHES and N. R. ITTNER. (Univ. Calif.). (*Food Res.*, 5 (1940), No. 1, pp. 83-87).—Carcasses from grain-fed hogs and from hogs fed largely or entirely on garbage were compared on the basis of carcass grade (after 48 hr. in the cooler) and refractive index values of the fat. The grain-fed hogs yielded a firmer carcass, and the water content of the muscle from cured and smoked meat was lower than that of the garbage-fed hogs. Processing did not influence the refractive index values. Both lots showed a loss of about 15 percent of the moisture of the muscle tissue during curing and smoking.

Avitaminosis in swine, R. GWATKIN and I. W. MOYNIHAN (*Canad. Jour. Compar. Med. and Vet. Sci.*, 4 (1940), No. 7, pp. 197-200, figs. 4).—This report from the Veterinary Research Station, Lethbridge, Alta., describes deficiency symptoms which developed in an experimental swine herd receiving ground grain, tankage, and salt mixture in dry lot. Loss of appetite, decrease in weight, and muscular incoordination generally occurred. Detailed case histories of two individuals are presented. Animals supplied with pilchard oil, milk, and green feed promptly recovered from this disorder, suggesting vitamin A and possibly vitamin D deficiency as the causative factor.

Practical poultry management, J. E. RICE and H. E. BORSFORD (*New York: John Wiley & Sons; London: Chapman & Hall, 1940, 4. ed., pp. XIX+604, pls. 2, figs. 333*).—The fourth edition of this well-known book has been revised and brought up to date (E. S. R., 64, p. 66).

Metabolizable energy of some chicken feeds, G. S. FRAPS, E. C. CARLYLE and J. F. FUNKE (*Texas Sta. Bul.*, 589 (1940), pp. 23).—Using the following values for the individual components of feeding stuffs and excreta—protein 5.7 Calorie per gram, fat 9.47, nitrogen-free extract and crude fiber 4.2, uric acid in

excreta 2.735, and ammonia in excreta 5.8 Calories per gram—a comparison of the heats of combustion found by analysis with those calculated by the usual method showed average percentage differences of 2.1 for 48 samples of feeds, 0.9 for 62 mixed rations, and 2.1 percent for 136 samples of excrements, with standard deviations of 2.8, 1.8, and 2.8 percent, respectively. The metabolizable energy values of feeds as determined by 128 tests with growing chickens compared closely with calculated values when a correction was made for protein retained. Using values of 4.4 Calories per gram of digestible protein, 9.47 Calories per gram of digestible ether extract, and 4.2 Calories per gram of nitrogen-free extract and crude fiber, the average difference between determined and calculated values was 2 percent, with a standard deviation of 2.8 percent. The heat of combustion of lactose was found to be 3.7 Calories per gram rather than 4.2 used for nitrogen-free extract in ordinary feeds, suggesting that when lactose makes up a considerable portion of the total carbohydrate content of the ration an allowance should be made in calculating metabolizable energy value.

Values of various protein feeds for growing chicks, R. M. SHEERWOOD and J. R. COTCH (*Texas Sta. Bul.* 588 (1940), pp. 20).—Continuing this line of investigation (E. S. R., 81, p. 98) six additional experiments, each involving six rations, were compared to determine the relative value of different combinations of protein-rich feeds for growing chicks. The protein concentrates included fish meal, meat and bone scraps, liver meal, cottonseed meal, soybean oil meal, peanut meal, and linseed meal, three or four of these being used in combination in each ration tested. In all cases rations containing 6 percent of the vacuum-dried fish meal produced, regardless of other constituents, greater gains with less feed required per unit of gain than when the fish meal was not fed. Liver meal was not a satisfactory substitute for fish meal in the combinations tested. Cottonseed meal and soybean oil meal were of about equal value when fed with other protein supplements, and both were superior to peanut meal or linseed meal. Rations containing 6 percent fish meal plus 5 percent choice dehydrated alfalfa leaf meal were not improved by the addition of whey as a source of vitamin G, but other combinations containing the alfalfa leaf meal but not the fish meal were improved by the inclusion of dried whey. From 3 to 3.6 units of feed were required for each unit of gain in live weight.

Studies on the metabolism of fowls.—III, The determination of the comparative nett energy of Sussex ground oats and white maize meal for fattening cockerels, T. DEIGHTON and J. C. D. HUTCHINSON (*Jour. Agr. Sci. [England]*, 30 (1940), No. 3, pp. 463–484, figs. 2).—Continuing this series of investigations (E. S. R., 83, p. 811) and employing direct calorimetry methods previously described (E. S. R., 82, p. 807), the comparative net energy for fattening of Sussex ground oats and white corn meal was determined on Light Sussex cockerels by difference experiments. The heat production of each experimental subject was determined during five 3-hr. periods daily while on a maintenance diet, on a supermaintenance diet containing the ground oats, on a supermaintenance diet containing the corn meal, and finally during a second period on the maintenance ration. The computed net energy per gram of dry matter was 2.573 kg. calories and 3.048 kg. calories for the ground oats and corn meal, respectively. There was no significant difference in the utilization of the metabolizable energy from the two cereals, the higher net energy value of corn being due to its higher digestibility.

Steamed potatoes for laying pullets, H. TEMPERTON and F. J. DUDLEY (*Harper Adams Util. Poultry Jour.*, 25 (1939–40), No. 7, pp. 177, 178).—In an experiment conducted at the National Institute of Poultry Husbandry, White

Leghorn pullets receiving a conventional-type mash and grain ration were compared with similar groups receiving 31, 41, and 50 percent, respectively, of steamed potatoes in their ration. Over a period of 6 mo. (October to April) there were no significant differences between the four pens in egg production or mortality, and feed costs were essentially the same for all lots. Only in gain in body weight did the control group significantly excel the potato-fed groups.

An experiment on the feeding of steamed potatoes and swedes to laying ducks. M. M. WRIGHT and F. J. DUDLEY (*Harper Adams Util. Poultry Jour.*, 25 (1939-40), No. 9, pp. 225, 226).—In an experiment similar to the one described above, Khaki-Campbell ducks receiving steamed potatoes or swedes in their ration compared favorably with birds on a conventional mash and grain ration with reference to rate and efficiency of egg production, maintenance of body weight, and mortality.

Steamed potatoes in table poultry rations. A. M. McMILLAN and F. J. DUDLEY (*Harper Adams Util. Poultry Jour.*, 25 (1939-40), No. 10, pp. 251, 252).—The substitution of steamed potatoes for corn meal at varying levels up to 15 percent of the total ration of growing chicks proved satisfactory. The rate of growth was similar on all rations. Mash consumption was reduced and the feeding costs lowered when the higher levels of corn meal were partially replaced by the potatoes.

Egg-white injury in chicks and its relationship to a deficiency of vitamin H (biotin). R. E. FAKIN, W. A. MCKINLEY, and R. J. WILLIAMS (*Science*, 52 (1940), No. 238, pp. 224, 225).—Chicks fed from 10 days of age on a diet containing 20 percent of dried egg white developed a pronounced syndrome characteristic of egg white injury by the eighth week, while chicks maintained on a diet like the above in all respects except that purified casein replaced the dried egg white remained in normal condition. The egg white and casein diets contained 0.67 γ and 0.39 γ of biotin per gram, respectively. Balance trials indicated that each group of chicks was excreting from 10 to 20 percent of their biotin intake as free biotin and from 15 to 25 percent as bound biotin. Analysis of body tissues of birds from 8 to 10 weeks of age showed the tissues of injured chicks to be consistently lower in biotin content than those of the control chicks. It is suggested that the biotin present in the egg white diet was not available to the tissues, presumably being destroyed by interaction with the egg white, hence it is probable that the injury caused by egg white is not due to any direct toxin but rather is produced indirectly by the action of the egg white in making the biotin of the diet unavailable.

Blood calcium levels of the fowl following injections of theelin. T. B. AVEY, H. M. SCOTT, and R. M. CONRAD. (Kans. Expt. Sta.). (*Endocrinology*, 27 (1940), No. 1, pp. 83-86).—Although intramuscular injections of 2,295 rat units of theelin per kilogram of body weight in molting hens over a period of 15 days failed to change the level of blood calcium, injections of 500 and 1,000 rat units into pullets caused transitory increases in blood calcium on the seventh and thirty-first days.

Levels of protein in rations for young turkeys. R. E. ROBERTS (*Indiana Sta. Bul.* 448 (1940), pp. 24, fig. 1).—Two starting rations for turkey poults, differing only in that one contained 10 percent of soybean oil meal and about 20 percent of total protein while the other contained 20 percent of soybean oil meal (10 percent soybean meal substituted for an equal amount of corn) and about 23 percent of total protein, were compared in two experiments, each involving pens of birds in confinement and on range. The average consumption of feed per bird to 12 weeks of age was approximately 2 lb. greater on the

higher protein feed, and the average total gain was also greater on this ration, an average of about 3 lb. of feed being required per pound of gain on each ration. Since other experiments have indicated that chicks grow equally well on the two levels of protein feeding, it is suggested that poults require more protein during the starting period than is needed by chicks. The rate of mortality was not significantly influenced by the ration.

Experiments during the growing period (from 12 to 24 weeks) involved a comparison of mash feeding on a ration containing 20.8 percent protein v. mash and grain feeding, with birds having continuous free access to all feeds. The total feed consumption per bird was less on the mash and grain ration than on the all-mash diet, the difference ranging from 6 to 14 percent in the different trials. The rate of grain consumption gradually increased with increasing age, approximately one-half as much grain as mash being consumed over the entire period. The final weight of both males and females on the all-mash rations was only slightly greater than the weight of those fed mash and grain, with a consequent saving of from 0.4 to 0.8 lb. of feed per unit of gain in favor of the mash and grain system. At 24 weeks the males exceeded the females in weight by slightly over 4 lb. on the average. The males required approximately 0.3 lb. less feed per pound of gain than the females. Birds which were heaviest at 12 weeks of age tended to be heavier at the end of the growing period.

The stone yard for small turkey flocks, A. BERRIDGE (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 1, pp. 33-35, fig. 1).—A stoneyard prepared by completely covering the ground with small field or cobblestones, as described and illustrated, has proved a satisfactory way of maintaining sanitary conditions for growing turkeys. Recommended management practices are discussed.

"Pigeon dermatitis," a vitamin B deficiency state with anemia, W. DAMESHEK and P. G. MYERSON (*Amer. Jour. Med. Sci.*, 199 (1940), No. 4, pp. 518-539, figs. 16).—White King pigeons, weighing from 300 to 550 gm., when maintained on a diet of polished rice and water with vitamin B₁ supplied through injections developed a dermatitis characterized by loss of weight and changes in the feathers and epidermis and accompanied by a progressive anemia associated with a hyperplastic, immature marrow. Administration of riboflavin, nicotinic acid, vitamin B₆, or the filtrate factor failed to alleviate the deficiency condition. Marked recovery followed the addition of yeast concentrate to the diet or the injection of dilute liver extract or vitamin B₁₂ complex. Concentrated liver extract gave a partial or delayed response. Injection of a purified chick antidermatitis principle resulted in a definite reticulocyte response, although erythrocyte count failed to increase. It is suggested that lack of this principle, either alone or in association with some unknown factor, may be responsible for the deficiency condition described. A possible relationship between pigeon dermatitis and pernicious anemia also is suggested.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products] (*Indiana Sta. Rpt. 1939*, pp. 18, 31, 64-69).—In addition to short summaries of research accomplishments for the past decade, results are briefly reported for studies on the vitamin A requirements of dairy cows, and the vitamin A-suppressing factor in soybean oil, both by J. H. Hilton, J. W. Wilbur, and S. M. Hauge; and a comparison of Sudan grass pasture v. bluegrass pasture in maintaining summer milk production, the influence of soybeans or of soybean products on milk production, fat composition, and physiological and metabolic processes, and input as related to output in milk production (coop. U. S. D. A.), all by Hilton, Wilbur, R. W. Bratton, and W. F. Epple.

Reports of studies on dairy products, by E. H. Parfitt, W. H. Brown, B. E. Horrall, Hilton, Epple, and J. C. Crane, include the cause and remedies of some abnormal flavors in milk, particularly "cappy flavor"; factors affecting body, texture, and quality of ice cream; the lecithin content of milk and its products; factors affecting the quality of Indiana butter, including lactic acid content, copper content, and relation of yeast and mold counts to bacterial count and phosphatase reaction; significance of mold mycelia in butter; the application of the Burri smear technic to butter; methods of washing and sterilizing milking machines; and enzymes in sweet and sour farm-skimmed cream.

Marketing studies, by V. C. Manhart, K. C. Boxell, and Horrall, relate to the effects of quality and associated factors on returns secured by the producer of milk and cream, and consumer reaction to graded butter.

[Investigations with dairy cattle and dairy products in Vermont] (*Vermont Sta. Bul.* 463 (1940), pp. 15-18).—Progress reports (E. S. R., 82, p. 381) are presented for the following: The effect of feeding vitamins A and D in concentrated cod-liver oil with different grades of hay to dairy calves; the conservation of nutrients in grasses and legumes by ensiling, artificial drying, and natural curing; artificial insemination of dairy cows; the efficiency of various materials for dairy barns; factors affecting the accuracy of the Babcock test; factors affecting the body of market cream; and the value of the resazurin test for evaluating the sanitary properties of the milk.

[Progress in dairy research at Reading] (*Univ. Reading, Natl. Inst. Res. Dairying, Ann. Rpt.*, 1939, pp. 16-78, fig. 1).—A description of the research activities of the National Institute for Research in Dairying and brief summaries of 85 papers published during the year ended September 1939.

Cull apples for dairy cows, A. D. PRATT and C. W. HOLDAWAY (*Virginia Sta. Bul.* 326 (1940), pp. 8).—A reversal-type feeding trial was conducted in which 9 lactating Holstein cows alternately received, in addition to grain, timothy hay alone, hay and cull apples (36 lb. per cow daily), or hay and corn silage. Equivalent amounts of dry matter were supplied in each instance. Milk production was satisfactorily maintained when apples were included in the ration. One lb. of dry matter from apples proved to be worth slightly more than 1 lb. from timothy hay but slightly less than 1 lb. from corn silage. With silage valued at \$4.50 per ton apples were worth \$2.36 per ton, and with timothy hay worth \$14 per ton apples were worth \$2.15 per ton.

The vitamin A requirements of dairy cows for the production of butterfat of high vitamin A value.—I, Artificially dried alfalfa hay (carotene), J. W. WILBER, J. H. HILTON, and S. M. HAUGE. (*Ind. Expt. Sta.*). (*Jour. Dairy Sci.*, 23 (1940), No. 8, pp. 765-769, fig. 1).—In two feeding experiments, each with two Guernsey cows, a basic ration of dried beet pulp, white corn, oats, and linseed oil meal was fed throughout, while artificially dehydrated alfalfa hay of excellent quality was added to the ration in increasing increments during successive 21-day feeding periods to provide a carotene intake equivalent to approximately 70,000-900,000 units of vitamin A per cow daily. The vitamin A potency of the milk fat produced during the successive feeding periods was determined by bio-assay. Under the conditions of these experiments it appeared that a daily intake of approximately 350,000 units of vitamin A per cow was required to return the vitamin A potency of the milk to its highest value.

Stables for dairy cattle, J. R. DICKE (*North Dakota Sta. Bimo. Bul.*, 5 (1940), No. 1, pp. 4, 5).—A summary of research (E. S. R., 82, p. 671).

Milk flavor important in goat breeding, J. C. MARQUARDT (*Farm Res. [New York State Sta.]*, 6 (1940), No. 4, p. 11, fig. 1).—The possibility of improving

goat milk flavor through the selection of breeding does on the basis of high quality in flavor of their milk is briefly discussed.

Ascorbic acid content of goat's milk and blood: Influence of ascorbic acid injection and diet. M. S. RICHMOND, G. H. SATTERFIELD, C. D. GRINNELL, and W. J. DANN. (N. C. Expt. Sta.). (*Jour. Nutr.*, 20 (1940), No. 2, pp. 99-108, figs. 3).—A large number of blood and milk samples taken from five Toggenburg goats receiving a normal ration over a 10-mo. period were titrated for ascorbic acid content. Values ranged from 0.6 to 0.8 mg. per 100 cc. of blood and from 0.5 to 2 mg. per 100 cc. of milk, with no consistent relationship between the content of the milk and that of the blood. Intraperitoneal injections of 1 or 2 mg. of ascorbic acid resulted in a rapid rise in blood ascorbic acid, a rapid very large rise in that of the urine, and a slower small rise in that of the milk. Ascorbic acid values of the blood during periods when goats were alternately fed a normal and a vitamin C-free diet showed that blood values are not closely dependent on the amount of ingested ascorbic acid. The diet affected the ascorbic acid content of the milk more than that of the blood.

Influence of age of cow on ascorbic acid content of certified milk. A. D. HOLMES, F. TRIPP, E. A. WOELFFER, and G. H. SATTERFIELD. (Univ. N. C. et al.). (*Food Res.*, 5 (1940), No. 3, pp. 263-273).—Continuing this series of investigations (E. S. R., 81, p. 270), an analysis of previously described data with reference to the age of the cows did not reveal any consistent relationship between the age of a cow and the amount of ascorbic acid in her milk.

The effect of holder and flash pasteurization on some flavors of milk. I, II, R. D. MACCURDY and G. M. TROUT. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 9, pp. 843-854, figs. 6; pp. 855-860).—Two reports are noted.

I. The effect of miscellaneous flavors common to commercial raw milk.—Samples of milk from each of 10 producers secured weekly over a 6-mo. period were subdivided and treated to give the following milks—raw, aerated and unaerated and pasteurized at 143° F. for 30 min., and flash pasteurized at 160°. All lots were scored and rescored after 1 and 3 days' storage. Feed flavor was the predominating feed defect in day-old raw samples, while heated flavor was most common in the holder-pasteurized lots. Flash-pasteurized samples showed a higher percentage of excellent flavor and also greater stability of excellent flavor during storage than the others. The mean flavor score of raw and holder-pasteurized day-old milks did not differ significantly, but the latter were of significantly better flavor after 3 days' storage. All samples declined significantly in flavor during 3 days' holding at 40°. Pasteurization increased the frequency of heated, oxidized, cooked, and old flavors, but decreased the frequency of feed, high acid, cowy, rancid, unclean, and other off-flavors. Mean flavor scores gradually declined from January to June, with the incidence of feed flavors gradually increasing. The incidence of oxidized flavor gradually increased to May and then declined sharply.

II. The effect on corn and alfalfa silage flavors.—By feeding graded levels of silage in proportion to milk production, it was found that feed flavors were produced in milk when 0.79 lb. of corn silage or 0.4 lb. of alfalfa silage per pound of milk produced were fed to cows 1 hr. before milking. Pasteurization reduced but did not entirely eliminate such off-flavors. Vacuum-holder pasteurization or forced-aeration holder pasteurization were superior to conventional pasteurization methods in removing silage flavors. The addition of a sufficient quantity of excellent-flavor milk to the silage milk reduced the flavor intensity so that pasteurization entirely removed it.

Variation in the oxidation-reduction potential as a cause for the oxidized flavor in milk. G. R. GREENBANK. (U. S. D. A.). (*Jour. Dairy Sci.*, 23 (1940),

No. 8, pp. 725-744, figs. 5).—This report of extensive investigations dealing with most of the factors known to be concerned in oxidized-flavor development presents information on the detection of samples susceptible to flavor development; causes of variation in susceptibility of individual milks; the effect of different feeds, particularly pasture; different storage temperatures; the presence of metals in milk, including variation in the time of adding metals; heating; bacterial growth; variations in ascorbic acid content; removal of air, light, and antioxidants on the intensity of oxidized-flavor development; the removal of oxidized flavor by a reducing agent; the promotion or inhibition of oxidized flavor by oxidizing agents; and controlling the development of the flavor by variations in the oxidation-reduction potential. The results of these investigations point to a direct relationship between the oxidation-reduction potential of the system and the tendency of a milk to develop off-flavors. It is concluded that the oxidized flavor of milk is caused by a mild oxidation of some minor constituent or constituents and, further, that more complete oxidation of the constituent or constituents involved results in the formation of tasteless compounds and hence no oxidized flavor. Copper is considered an ideal catalyst for flavor development because the Eh value of the milk when this metal is added is great enough to promote oxidation but not great enough to promote a rapid oxidation of the reaction concerned to completion. The protective influence of heating milk or feeding the animals producing the milk on green feeds is attributed to an increase in the poisoning action of the milk, thereby inhibiting flavor development.

Enzymes and other substances as antioxidants in milk, D. H. NELSON and C. D. DAHLE (Pa. Expt. Sta.). (*Milk Dealer*, 29 (1940), No. 10, pp. 41, 42, 44, 46, 48, 50, 52-55).—Milk obtained from individual cows known to produce milk resistant to spontaneous oxidized flavor was used in all the experiments, and control samples consisted of the pasteurized milk plus 1 or 2 p. p. m. of copper. Pure ascorbic acid was highly effective in inhibiting oxidized flavor development, and the ascorbic acid practically disappeared before the oxidized off-flavor appeared. The addition of fresh orange juice or tomato juice to the milk afforded even greater protection against this off-flavor than would be expected on the basis of the ascorbic acid contributed by them. The addition of 0.3 percent oat flour to milk also inhibited this off-flavor but did not reduce the rate of ascorbic acid destruction, indicating that oxidized flavor will not necessarily develop in the absence of ascorbic acid. Citric acid when added to milk failed to exhibit antioxidative properties. Of three pancreatic enzymes tested, pepsin exhibited no antioxygenic effect while both trypsin and steapsin (particularly the latter) effectively inhibited oxidized flavor development, suggesting that the beneficial effect of such enzymes is due to their action on the fatty material rather than on the protein fraction of the milk. An alcoholic solution of gum guaiac, which is water insoluble and only slightly soluble in fat, was a highly effective antioxidant for copper-induced oxidized flavor. However, concentrations which could be used without imparting an undesirable flavor to milk did not inhibit oxidation of ascorbic acid. The addition of 5 percent crude sugar inhibited oxidized flavor during 3 days' storage, but refined sugar was ineffective in this respect.

Trypsin: An anti-oxygen for milk, F. J. DOAN and G. M. MILLER (Pa. Expt. Sta.). (*Milk Plant Mo.*, 29 (1940), No. 9, pp. 42-47).—Small amounts of trypsin were added to batches of cold, fresh, raw milk containing 1 p. p. m. of copper, the quantity of the enzyme ranging from 0.00032 to 0.0064 percent. The milks were then pasteurized, cooled, and examined for flavor after from 24 to 48 hr. A quantity of enzyme in excess of 0.00128 percent proved highly

effective in preventing the development of oxidized flavor in the milk. Proteolysis resulting in a bitter flavor and coagulation of the milk on boiling became noticeable when the concentration of trypsin reached 0.0064 percent. Heated trypsin proved inert as an antioxidant, indicating that the inhibitory effect observed is contingent on a short period of enzymatic action prior to pasteurization.

Effect of subcutaneous implantation of adrenalin tablets on blood-sugar and milk composition in lactating ruminants, A. C. BOTTOMLEY, S. J. FORLEY, F. H. A. WALKER, and H. M. S. WATSON (*Jour. Endocrinol.*, 1 (1939), No. 3, pp. 287-299, figs. 7).—In experiments at the National Institute for Research in Dairying, adrenalin (in the form of the free base) tablets were implanted subcutaneously at an approximate rate of 50 gm. per 100 lb. of live weight in three lactating goats and one lactating cow. In each instance a pronounced hyperglycemia was maintained for many hours following the implant. Blood lactic acid rose appreciably during the same period, and coincidentally the lactose content of the milk increased. In most cases milk yield declined slightly and the solids-not-fat of the milk tended to increase temporarily, but the milk fat was not uniformly affected. The normal arterial blood lactic acid content in the normal lactating goat was found to range from 5.4 to 15 mg. percent.

Checking the sanitary quality of milk and other dairy products, H. H. WEISER. (Ohio State Univ.). (*Milk Dealer*, 29 (1940), No. 11, p. 36).—Using a medium of nutrient agar plus 5 percent of sterile defibrinated horse blood, 75 samples of mastitis milk (both incubated and unincubated) were examined by the Burri smear technic. Streptococcus colonies were observed in 40 of the unincubated and 55 of the incubated samples. The types of streptococci present were also determined by the action of the colonies on the blood agar. The desirability of incubation before inoculation is apparent from the results. It is suggested that by varying the composition of the medium to suit the needs of the various types of bacteria the Burri technic may be very useful in studying the numbers and types of organisms in milk as well as in other dairy products.

Observations on the growth responses of Streptococcus lactis in mastitis milk, C. C. PROUTY. (Wash. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 9, pp. 899-904).—In a study involving milk samples from both infected and non-infected udder quarters of cows suffering from mastitis it was found that milks having an initial pH greater than 6.9 usually failed to support growth of *S. lactis*. Adjusting the pH of mastitis milk to that of normal milk resulted in only partially overcoming delayed acid development. *S. lactis* development was retarded by the addition of as little as 10 percent of very abnormal mastitis milk to normal milk. Holder pasteurization of mastitis milk generally had little effect on the retarding influence on the growth of *S. lactis*, although in some samples such heat treatment partially overcame the retarding influence.

Studies of the resazurin test for milk, J. M. BRANNON. (Univ. Ill.). (*Milk-Plant Mo.*, 29 (1940), No. 5, pp. 51, 54, 55).—Data are presented on the comparative results obtained by examining milk with the methylene blue reduction and resazurin tests, the plate count, and the direct microscopic count. On the whole, there was close agreement of the different methods. The resazurin test was generally more rapid than the methylene blue reduction test, but the latter is considered by the author to be simpler and more dependable in the hands of the less-experienced operator. It is recommended that the direct microscopic count be used in conjunction with either color test.

Physical and chemical properties of the fat globule adsorption "membrane."—II, Nature and origin of surface active materials involved in curd

tension reduction and prevention of rennet clot of cow's milk by "membranes" from natural and synthetic creams, L. S. PALMER and N. P. TARASSUK. (Minn. Expt. Sta. coop. Univ. Calif.). (*Jour. Dairy Sci.*, 23 (1940), No. 9, pp. 861-871).—Continuing this series (E. S. R., 81, p. 833), further experiments gave evidence that the addition of artificial fat globule membrane sols derived from spray-dried whey to natural or remade skim milk markedly reduced its curd tension. Interference with the normal clotting of milk by rennet due to the protein denaturation of these sols is suggested as an explanation of this phenomenon. Normal rennet clot was completely prevented and surface tension and pH were lowered by emulsifying a small amount of diglycol laurate into raw milk at room temperature, aging the emulsion at low temperature, and adding rennet at 35° C. Remade buttermilk from creams whose butterfat globule membrane was diglycol laurate behaved in a similar manner, which is explained on the basis of the liberation of lauric acid from the diglycol ester by natural milk enzyme. It did not occur if the milk was first pasteurized.

Lipolytic activity in milk and cream, D. C. ROAHEN and H. H. SOMMER. (Univ. Wis.). (*Jour. Dairy Sci.*, 23 (1940), No. 9, pp. 831-841).—The results of a series of experiments are included in this report. When 10 gm. of raw cream was inoculated into 100 gm. of a substrate consisting of sugar-saturated cream, lipolysis was greatly limited by the addition of from 0.05 to 0.15 cc. of formalin and markedly accelerated by the addition of from 1 to 2 gm. of tributyrin, as measured by the titer of the steam distillate. Gravity-separated cream showed considerably greater lipolysis than separator cream from the same milk, as measured by the titer of the distillate and the acid number of the fat. Lipolysis of whole milk was increased by shaking. However, when the same milk or cream was inoculated into the sugar-cream substrate shaking decreased lipolysis. Lipolytic activity in whole milk was affected by temperature, it being relatively very high at 37° C., less at 27°, and much less at from 3° to 4°. Cream held at from 3° to 4° exhibited maximum lipolysis at pH 8.4 to 8.6. Cream separated at 110° F. showed less lipolysis than that separated at 75°. Individual milk samples from the same cow and from different cows varied in lipolysis, but no relationship between stage of lactation and lipolytic activity could be established.

Watery appearance of frozen homogenized milk, G. M. TROUT (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 1, pp. 10-19, figs. 8).—Pasteurized milks homogenized at pressures of 500, 1,500, 2,500, and 3,500 lb. were compared with unhomogenized samples in a series of freezing and thawing tests. The homogenized samples froze at a slightly faster rate than unhomogenized milk, with freezing time tending to increase as homogenization pressures decreased. The frozen plugs forced above the neck of ordinary milk bottles were very similar in appearance for the homogenized and unhomogenized samples. On thawing the homogenized milk presented a thin watery appearance at the top of the container, the volume of watery-appearing material increasing with increasing homogenization pressures. On mixing, the thawed samples of homogenized milk appeared as smooth as unfrozen milk. Creaming did not occur in the homogenized milk after freezing and thawing.

[Investigations in dairy bacteriology] (*J. Internat. Cong. Microbiol.*, New York, 1939, *Rpt. Proc.*, pp. 713-728).—Abstracts of the following papers, presented before the subsection in dairy bacteriology, are noted: The Ripening Process of Hard Cheese, by S. Orla-Jensen; Bacteriological Methods in Cheese Research [trans. title], by R. Burri; Acidoproteolytic Cocci in American Cheeses, by C. Gorini; The Presence of Propionic Acid Bacteria in Different

Types of Cheese [trans. title], by K. J. Demeter and A. Janoschek; Dye Reduction Tests for Controlling Milk Quality, by C. K. Johns; Application of the Burri Smear Culture Technic to Various Solid Dairy Products, by B. W. Hammer; The Germicidal Activity of Hydrogen Peroxide Upon Bacterial Spores, by H. R. Curran, F. R. Evans, and A. Leviton; The Coli Bacilli and Coli Phages in Milk [trans. title], by I. Lipska; Some Media for the Detection of Gram-Negative Bacteria in Pasteurized Milk, by C. N. Stark; A Potentiometric Method of Detecting Milk Susceptible to Oxidation, by A. C. Fay, J. L. Mahoney, and E. W. Woelffer; The Use of Tributyrin Agar in Dairy Bacteriology, by J. A. Anderson; and Thermal Death Studies of Bacteria in Non-aqueous Environments, by C. S. Mudge and D. C. Foord.

Bacteriological studies on the cleaning of milking machines, E. H. PARFITT (Indiana Sta. Bul. 449 (1940), pp. 7).—Based on the principle of cleaning milking machines as previously described (E. S. R., 66, p. 168), the influence of certain modifications in the method of washing and sterilizing has been investigated. The addition of a rinse solution containing 200 p. p. m. of chlorine through the entire system just before use resulted in a greater decrease in the bacterial population of the machines than a clear-water rinse of the same volume. A hot-water rinse immediately following the cold-water rinse in washing the machine yielded a lower bacterial count than when the hot-water rinse was omitted. The use of lye solution in the teat cups and milk tubes during cold weather (house temperature from 25° to 35° F.) was found to be advantageous in reducing the bacterial count. A procedure, as described, for sterilization of the vacuum check valve proved effective in eliminating thermophilic organisms from the system.

The gas requirements of molds, II, III, N. S. GOLDING. (Wash. Expt. Sta.) (Jour. Dairy Sci., 23 (1940), No. 9, pp. 879-889, figs. 7; pp. 891-898, figs. 4).—Two additional reports in this series are noted (E. S. R., 77, p. 846).

II. The oxygen requirements of *Penicillium roqueforti* (three strains originally isolated from blue veined cheese) in the presence of nitrogen as diluent and the absence of carbon dioxide.—Three strains of blue mold isolated from cheese were each grown at seven different temperatures (from 46° to 90° F.) in an atmosphere devoid of CO₂ and containing from 21 to 2.1 percent O₂, obtained by adding N₂ to the air. Only in the case of the greatest O₂ dilution did a significant decrease in mold growth occur, retardation at this O₂ level ranging from 16 to 54 percent. Greatest retardation occurred at the higher temperatures.

III. The effect of various concentrations of carbon dioxide on the growth of *Penicillium roqueforti* (three strains originally isolated from blue-veined cheese) in air.—Using the same strains of mold and the same temperature range as above, the molds were grown in atmospheres of air devoid of CO₂ and in mixtures of air and CO₂ in 8:2, 6:4, 3:7, and 2:8 ratios. In each instance maximum growth occurred when 20 percent CO₂ was added to the air, while higher concentrations of CO₂ tended to inhibit growth. The three strains, while following the same trends, showed differences in CO₂ tolerance. The acceleration in growth due to low concentrations of CO₂ and also inhibition due to high concentrations took place sooner at the lower temperatures.

Butter: Its composition and deterioration, H. H. KETCHMAR (Jour. Dept. Agr. West. Austral., 2. ser., 17 (1940), Nos. 1, pp. 93-134, figs. 3; 2, pp. 141-152).—A comprehensive review, including 104 references.

The effect of standardizing the acidity in the manufacturing of cottage cheese and cultured buttermilk, L. E. MULL, W. H. E. RED, and W. S. ARBUCKLE (Missouri Sta. Res. Bul. 319 (1940), pp. 36, figs. 4).—Using a short-time

(5-hr.) method of cottage cheese manufacture throughout the series, the reported variable procedures used in the experimental manufacture included: Adjusting the acidity of the skim milk by the addition of a stabilizer to 0.0, 0.05, or 0.1 percent before adding the starter and rennet, to 0.05 percent after adding the starter or after both starter and rennet were added, and 0.05 percent with more than the normal amounts of starter and rennet added; also washing in either normal or alkaline water; creaming with normal cream (0.2 percent acidity) or cream standardized to 0.1 or 0.0 percent acidity; and storing as dry curd, in plain water, in alkaline water, or as creamed curd. Observations on the body and flavor of the cheeses in a fresh condition and after varying periods of storage led to the conclusion that the use of a moderate amount of standardizer in the skim milk resulted in an improved flavor of the cottage cheese, while an excess amount produced an unnatural flavor and impaired the keeping quality. Slight alkalinity of the wash water gave a clean, mild, full-flavored product, but excess standardizer in the wash water produced a slick gelatinous curd of unnatural flavor, weak body, and poor keeping quality. Reducing the acidity of the cream improved the flavor but tended to impair the keeping quality of the cheese. The use of a standardizing agent at more than one step in the manufacturing process was detrimental to the body and keeping quality of the cheese. Prolonged storage of the curd in alkaline water resulted in unnatural flavor and weak body. As the pH decreased, the keeping quality of the cheese tended to decrease. In studies with cultured buttermilk, acidity standardization of the original milk, an increase in the amount of starter, and a higher than normal setting temperature resulted in the production of a high-quality buttermilk in 5 hr. Adjusting the acidity after incubation resulted in an unnatural, sweet flavor. As with cottage cheese, this product showed a close correlation between pH and keeping quality.

Many cheese varieties improved by research, J. C. MARQUARDT (*Farm Res. [New York State Sta.]*, 6 (1940), No. 4, p. 3, figs. 3).—Advancements in manufacturing and curing methods for Trappist-type cheese are discussed. The importance of technical control of setting and salting, and particularly of humidity and temperature control in the curing room, is stressed.

Effect of various bacteria on flavor of Cheddar cheese made from pasteurized milk, W. C. HARRIS and B. W. HAMMER. (Iowa State Col.). (*Jour. Dairy Sci.*, 23 (1940), No. 8, pp. 701-708).—In the experiments described pasteurized cheese milk received, in addition to a regular cheese starter, an inoculation of an organism to be tested. Of 34 pure cultures of micrococci originally isolated from Cheddar cheese, 7 were found to have an undesirable effect on cheese flavor, 14 had no definite effect, and 13 definitely improved cheese flavor. It appeared that micrococci to be employed in the manufacture of Cheddar cheese should be selected on a strain rather than on a species basis, since strains belonging to the same species differed in their effect on flavor. Of 7 strains of propionic acid bacteria tested, some improved cheese flavor when used in relatively small numbers, and all improved the flavor when added in large numbers. It appeared that various organisms other than the usual cheese cultures might be used to advantage in improving the flavor of pasteurized milk Cheddar cheese.

The relationship of moisture in Swiss cheese to quality and yield, G. P. SANDERS, R. R. FARRAR, R. E. HARDELL, F. FEUTZ, and L. A. BURKEY. (U. S. D. A., Univ. Wis., and Ohio State Univ.). (*Jour. Dairy Sci.*, 23 (1940), No. 9, pp. 905-918, figs. 5).—A study of the relationship of moisture content to grade for 418 factory-made Swiss cheeses and 218 experimental cheeses led to the conclusion that the presence of an excessive amount of moisture is generally detri-

mental to the quality of the cheese. The effects of 21 variables in the milk and manufacturing process upon the moisture content of the cheese are described. In general, those practices which permit inclusion of a comparatively large amount of moisture did not result in sufficient increase in yield to justify their use.

The application of the frozen pack method to preservation of soft cheese, N. S. GOLDING and M. E. MORGAN. (Wash. Expt. Sta.). (*Milk Dealer*, 29 (1940), No. 9, pp. 42, 44, 46, 48).—Processes employed included the packaging of Neufchâtel, Neufchâtel plus pimienta, and Gervais cheeses in $\frac{1}{2}$ -lb. flat cans, sealing under air pressure or under vacuum, and freezing either immediately or 1 or 4 days after sealing. Samples were removed from frozen storage and examined for quality at frequent intervals up to several months. In general the cheese responded well to frozen storage. Texture and palatability were not noticeably affected. Defects apparent in the fresh cheese were still present after frozen storage, but did not increase. Pasteurization of the cheese milk or cream at 170° F. for 10 min. was generally less desirable than heating at 145° for 30 min. since the former tended to produce cooked flavor. There was no recognizable difference in air-sealed and vacuum-sealed cheeses up to 8 weeks, but slight oxidized flavor developed in the air-sealed lots after prolonged storage.

The application of the frozen pack method to preservation of Devonshire or clotted cream, N. S. GOLDING and M. E. MORGAN. (Wash. Expt. Sta.). (*Milk Dealer*, 29 (1940), No. 10, pp. 42, 67–69).—In this experiment clotted cream prepared by the conventional method was subjected to packaging and frozen storage in a similar manner to that employed with soft cheese as noted above. Freezing immediately after packaging was superior to freezing 4 days after sealing, as some defects developed in the cream during the intervening period. No significant changes occurred in the frozen product during approximately 6 mo. of storage, indicating that this method of handling is well suited to clotted cream.

Value of salt in cheesemaking, J. C. MARQUARDT and L. RESL. (N. Y. State Expt. Sta.). (*Natl. Butter and Cheese Jour.*, 31 (1940), No. 10, pp. 32, 34, 36).—A summary of the salt content of cheese entered in competition at the 1940 New York State fair, including 193 samples representing 8 types of cheese. Average salt values for the different types were export Cheddar 1.64, home-trade Cheddar 1.55, washed curd 1.62, sage 1.54, young American 1.52, pimienta and miscellaneous 1.75, picnic twins 1.5, and single daisies 1.52 percent.

Retarding mold in cheese, F. W. MILLER, JR. (*Natl. Butter and Cheese Jour.*, 31 (1940), No. 8, pp. 12, 13, 38).—In an effort to control mold development on cheese slices, $\frac{1}{2}$ - and 1-lb. wedges of cheese were dipped in solutions of varying concentration of propionic acid or its calcium or sodium salts for a few seconds, then drained and wrapped in Cellophane. The most favorable results were secured by dipping in an 8-percent propionic acid solution. This treatment greatly increased the mold-free life of the cheese without affecting its flavor or color. Solutions of the salts were effective when used in higher concentrations.

A study of the characteristics of a milk supply as related to the manufacture of plain condensed skimmilk for ice cream making, L. K. CROWE and D. D. DEANE. (Nebr. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 9, pp. 919–929, fig. 1).—Nine lots of mixed herd milk of normal composition were processed at approximately 4-week intervals from October through May. The freshly separated skim milk was condensed to a total solids content of about 33.5 percent, and portions of each lot were placed in storage at 0° F. Ice cream mixes were prepared from each lot of the condensed milk when fresh and after 4 weeks' frozen storage. No definite relationship was found between the acidity of the milk products and the pH and protein stability. No milk was found to produce condensed skim milk unstable to freezing and storing for 4 weeks, and

such treatment did not alter its physical appearance or body other than to make it slightly sandy. Titratable acidity increased during frozen storage, but protein stability was affected only slightly. No significant trends in titratable acidity, pH, or viscosity of the ice cream mixes could be attributed to changes produced by the frozen storage, and ice creams produced from the fresh and frozen condensed skim milk were similar in quality.

Further observations on basic viscosity of ice cream mixes and a simplified procedure to obtain it, E. S. PENCZEK and A. C. DAHLBERG. (N. Y. State Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 8, pp. 691-700, fig. 1).—A comparison of the effect of a hand-operated emulsifier and the Whitaker device (E. S. R., 61, p. 869) on the viscosity of ice cream mixes led to the conclusion that the former is simpler, more practical, and more efficient than the latter in reducing the apparent viscosity of the mix to basic viscosity. The lower minimum viscosity obtained by the hand emulsifier was not due to the size of the fat clumps and fat globules but rather to the fact that it was more effective than the Whitaker device in breaking down the gel structure. None of the methods employed was capable of destroying the regelatinizing power of the gelatin used in these trials.

Relationship of hydrometer readings to the composition and some physical properties of pan condensed ice cream mixes, R. A. LARSON (Mich. State Col.). (*Ice Cream Rev.*, 23 (1940), No. 10, pp. 34, 92-96, 98).—A summary of research previously noted (E. S. R., 83, p. 394).

Technical literature of ice cream for 1939, A. LEIGHTON. (U. S. D. A.). (*Ice Cream Rev.*, 24 (1940), No. 1, pp. 34, 36, 38, 42, 46, 48, 50, 51).—A comprehensive review, including a bibliography of 161 references.

VETERINARY MEDICINE

[Work in animal pathology by the Indiana Station], A. L. DELEZ, L. P. DOYLE, R. A. CRAIG, C. NEWTON, and F. L. WALKER (*Indiana Sta. Rpt.* 1939, pp. 24, 105-109).—The work of the year (E. S. R., 81, p. 707) reported upon includes studies of Bang's disease, death loss in newborn pigs, and lesions produced by the hog cholera virus; encephalomyelitis in horses and mules and in chicks (leg weakness, epidemic tremors); transmission of paralysis, leucosis, and neoplastic conditions in chickens; hog cholera serum and virus tests; laboratory diagnoses of diseases of poultry and livestock; and agglutination tests for Bang's disease (brucellosis) and pullorum disease.

Early history of preventive medicine, with special reference to the viruses of animal origin, B. M. LYON (*Vet. Med.*, 35 (1940), No. 8, pp. 430-435, figs. 3).

The synergism of human influenza and canine distemper viruses in ferrets, F. L. HORSFALL, JR., and E. H. LENNETTE (*Jour. Hyg. Med.*, 72 (1940), No. 3, pp. 247-259, fig. 1).—Report is made of a study of infections produced in ferrets by human influenza virus and canine distemper virus. "Cross-immunity and cross-neutralization tests showed that these two viruses were not related antigenically. Ferrets infected with influenza virus alone rapidly produced considerable quantities of neutralizing antibodies, and after the sixth day virus was not demonstrable in their lungs. Ferrets infected with both influenza and distemper viruses simultaneously produced but small amounts of neutralizing antibody, and influenza virus persisted in undiminished concentration in their lungs throughout the course of the infection."

Progress in chemotherapy of bacterial and other diseases, with special reference to the prontosils, sulfanilamide and sulfapyridine, J. A. KORRIS (*Arch. Int. Med.*, 65 (1940), No. 4, pp. 671-743).—This review of the history and present status of knowledge of the subject is presented with a 19-page list of references to the literature.

The effect of sulfanilamide on several parasitic infections of laboratory rats and mice, S. ZURETT and J. T. CULBERTSON (*Jour. Parasitol.*, 26 (1940), No. 3, pp. 235, 236).—It was found that sulfanilamide was without effect in experimental infections with *Trypanosoma lewisi*, *T. cruzi*, and *T. equiperdum* in rats and in experimental infection with *T. duttoni* in mice. It was likewise without effect upon natural protozoan infections of mice with *Endamoeba muris*, *Trichomonas muris*, *Giardia muris*, and *Hexamita muris*.

Sulfapyridine in avian tuberculosis: The effect of sulfapyridine on the bacillaemia of rabbits infected experimentally with avian tubercle bacilli, A. G. KARLSON and W. H. FELDMAN (*Amer. Rev. Tuberc.*, 42 (1940), No. 1, pp. 146-150, fig. 1).—In the experimental work reported the daily administration of sulfapyridine failed to prolong the lives of rabbits artificially infected with avian tubercle bacilli. "Sulfapyridine failed to modify the gross changes characteristic of the Yersin type of tuberculosis in rabbits inoculated with avian tubercle bacilli. In rabbits that received sulfapyridine before being infected and twice daily thereafter, the number of cultivable avian tubercle bacilli in the blood was reduced apparently as a consequence of the drug."

Changes in the insecticidal value of the roots of cultivated devil's shoe-string (*Tephrosia virginiana*) at four seasonal growth periods, A. F. SIEVERES, M. S. LOWMAN, G. A. RUSSELL, and W. N. SULLIVAN. (U. S. D. A. and Tex. Expt. Sta.). (*Amer. Jour. Bot.*, 27 (1940), No. 5, pp. 284-289, fig. 1).—The authors' studies indicate that at the full-bloom stage the roots of *T. virginiana* are significantly more toxic to houseflies than at the dormant and emergence stages, but their superiority over those at the mature-seed stage is less so. The chloroform extractive and rotenone content is also highest at the full-bloom stage. The toxicity of the roots of the several clonal progenies of the same parent does not vary significantly, but significant differences were found in this respect between the progenies of different parents.

Destruction of eggs and non-infective larvae, T. W. M. CAMERON (*Canad. Jour. Compar. Med.*, 3 (1939), No. 9, pp. 248-254).—The results obtained from the mixing of numerous chemicals with feces that contained nematode eggs varied with the nature and quantity in their effect upon the eggs and larvae.

The comparative value of some further chemicals in the treatment of manure against sclerostome larvae, I. W. PAENELL (*Canad. Jour. Compar. Med. and Vet. Sci.*, 4 (1940), No. 3, pp. 76, 77, fig. 1).—Substances additional to those noted by Cameron above are reported upon.

Effects of freezing temperatures on the embryonation of eggs and infectivity of larvae of *Heterakis gallinae*, A. B. WICKWARE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 4 (1940), No. 4, pp. 110-116).—"Nonembryonated eggs of *H. gallinae* were successfully embryonated after exposure to freezing temperatures for periods ranging from 67 to 172 days. Except for those eggs that hatched normally after exposure to a -2° F. freezing temperature for a period of 67 days, the percentage rate of eggs reaching the coiled embryo stage was lower in each instance than in normal control cultures. The percentage rate of infectivity of such eggs for young chicks, with experiments considered collectively, was also somewhat lower than the rate observed in the control group."

Transmission of immunity to *Trichinella spiralis* from infected animals to their offspring, E. A. MAUSS (*Amer. Jour. Hyg.*, 52 (1940), No. 2, Sect. D, pp. 75-79).—In experiments conducted with the offspring of trichinous rats, rabbits, and hamsters the percentage development of infecting doses of trichina larvae was lower than in the offspring of uninfected animals. This lowered susceptibility to infection was lost by the hamsters as early as the third

week after birth, and the time before parturition of infection of the mother hamsters did not appear to influence the degree of immunity transmitted to the young. Examination for trichinae after complete digestion of the musculatures of 5 rats, 5 rabbits, and 24 hamsters, all offspring of infected mothers, revealed not one case of prenatal infection, eliminating actively acquired immunity as a possible cause for the partial immunity demonstrated to exist in these animals.

The *in vitro* effect of immune serum upon *Trichinella spiralis* larvae, E. A. MAUSS (*Amer. Jour. Hyg.*, 32 (1940), No. 2, Sect. D, pp. 80-83).—It was found that "*T. spiralis* larvae which have been incubated at 37° C. for 18 hr. in 43 percent homologous immune serum are only 30 percent as infective as larvae which have been incubated under the same conditions in 43 percent normal serum. There is a similar reduction in infectivity of larvae exposed to 0.9 saline solution, but the reduction becomes statistically insignificant when 10 percent normal rabbit serum is added to the saline."

Methods of exposing experimental animals to virus infection through mosquito vectors, R. A. KELSEY (*Amer. Jour. Pub. Health*, 30 (1940), No. 8, pp. 866-870).

The use of sodium lauryl sulphate lactose tryptose broth as a primary medium for detection of coliform group, W. L. MALLMAN and C. W. DARBY. (Mich. State Col.). (*Jour. Bact.*, 40 (1940), No. 1, pp. 143, 144).

Serological reactions and species specificity of some helminths, R. W. WILHELM (*Biol. Bul.*, 79 (1940), No. 1, pp. 64-90).—The value of the precipitin reaction as a method for determining phylogenetic relationships of helminths has been demonstrated, since this reaction differentiated species and expressed relationships which are in agreement with those derived from morphological comparisons of the species studied.

The presence of a capsule on *Brucella* cells, I. F. HUDDLESON. (Mich. State Col.). (*Jour. Bact.*, 40 (1940), No. 1, p. 162).—In the studies conducted, all smooth strains of *Brucella* were found to possess a definite capsule, while dissociated forms did not show a capsule. The size of the bacterial cells plus capsules varied from 1.5 μ to 2.5 μ . Capsular swelling was not demonstrated in the presence of antisera. The technique used for demonstrating the capsule is a modification of the Burri India ink method.

A quantitative study of a protein-nucleate and its components prepared from the *Brucella* group of organisms, and their interaction with *Brucella* specific sera, R. B. PENNELL (*3. Internat. Cong. Microbiol., New York, 1939, Rpt. Proc.*, pp. 791, 792).—Data obtained in connection with the work at the Michigan Experiment Station previously noted (E. S. R., 82, p. 533) are presented.

Furunculosis in Oregon fish, J. N. SHAW and L. SEGHEITL (Oreg. Expt. Sta.). (*Cornell Vet.*, 30 (1940), No. 1, pp. 21-24).—In an investigation of affected native cutthroat fingerlings (*Salmo clarkii clarkii*) from a hatchery at Corvallis, where several hundred had been lost each day, an organism identical with *Bacterium salmonicida* was isolated from lesions on the body. The disease appeared to be more prevalent during hot weather and so far as known occurred only in rearing ponds.

A check-list of the nematode parasites of the domesticated animals in Burma, II, J. BHATTACHARJEE (*Indian Jour. Vet. Sci. and Anim. Husband.*, 10 (1940), No. 1, pp. 119, 120).—In continuation of the check list previously noted (E. S. R., 78, p. 393), nematode parasites of animals identified by the author from collections of the Veterinary Research Laboratory, Insein, Burma, are recorded.

Observations on anaplasmosis in Antigua, B. W. I., L. R. HUTSON (*Trop. Agr. [Trinidad]*, 17 (1940), No. 8, pp. 147, 148).—The occurrence of anaplasmosis in Antigua is reported and confirmed. A clinical case report of this disease in a dairy cow is presented.

Bovine contagious abortion in relation to public health, W. T. ROWLANDS (*Jour. Roy. Sanit. Inst.*, 61 (1940), No. 1, pp. 16-25).

Vaccination for Bang's disease, W. WISNICKY. (Univ. Wis.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 762, pp. 221-229, figs. 3).—A report on the progress of control work and the role of calf vaccination.

Some observations on the eradication and control of Bang's disease, W. N. PLASTRIDGE, L. F. RETTGER, and G. C. WHITE. ([Conn.] Storrs Expt. Sta.) (*Jour. Dairy Sci.*, 23 (1940), No. 8, pp. 755-763).—In work at the station during the period 1925-39 the number of cows' blood samples tested annually for Bang's disease increased from 2,373 to 42,700, the number of herds from 27 to 624, and the number of herds passing one or more negative tests from 4 to 473. The average incidence of infection observed in infected herds at the time of the initial tests was found to be about 25 percent. The average number of suspicious reactors that became positive was 16.6 percent in herds which were negative in the preceding test, 26 in herds in which spread of infection was slow, and 63.6 percent in herds in which spread of infection was rapid. Of 149 infected herds, 64.5 percent required from 1 to 2 tests for eradication, 22.7 required from 3 to 4, and 12.7 percent, more than 4 tests. The principal source of reinfection was found to be association with infected animals, either as the result of adding cows or bulls from untested or infected herds, or of animals breaking into or out of pasture. Association with infected horses or swine accounted for several "breaks," and in some instances available evidence indicated that infection resulted when people went directly from infected to negative herds. It is concluded from available information that, in general, breaks are preventable. In about half of the reinfected herds regular 6-mo. retests detected new infection before it had a chance to spread to more than one or two animals.

A study of an epidemic of brucellosis due to *Brucella melitensis*, I. F. HUDDLESON and M. MUXER. (Mich. Expt. Sta.). (*Amer. Jour. Pub. Health*, 30 (1940), No. 8, pp. 944-954, fig. 1).—Report is made of the study of a brucellosis epidemic that occurred during the winter of 1938-39 at the Michigan State College, in which 45 individuals developed the clinical form and possibly 49 the subclinical form of the disease. *B. melitensis* was cultured from the blood of 36 of the clinical and 3 of the subclinical cases. No other species of *Brucella* was involved. All possible sources of the infective material responsible for the epidemic are mentioned and discussed. The results of the different laboratory diagnostic tests show that no one test is always sufficient to confirm the diagnosis of clinical brucellosis shortly after onset. The combined results of all the laboratory tests show that active infection and clinical infection are not synonymous. An individual may be infected with *Brucella* and yet never show clinical symptoms of the disease.

Immunity to *Br. abortus* infection, A. D. McEWEEN (*Vet. Rec.*, 52 (1940), No. 24, pp. 441-444).—The author is led to conclude that the vaccination of cattle against *Brucella abortus* infection with a living virulent vaccine results in a high resistance to reinfection, and that the vaccinated animals which abort do so because of a vaccination infection and not on account of subsequent exposure to infection.

Paratuberculosis (Johne's disease) of cattle in Assam.—I, Its incidence and epizootology, P. G. PANDF (*Indian Jour. Vet. Sci. and Anim. Husband.*, 10

(1940), No. 1, pp. 40-62).—In a survey made of the incidence of Johne's disease among government farm animals in Assam, conducted mainly by use of the avian tuberculin test, all classes and breeds of animals and crossbreds were found equally susceptible to the disease. An unusually high incidence was found among calves, but post-mortem evidence of the disease in such young animals has not been obtained.

The control of the chronic form of streptococcic mastitis, R. B. LITTLE (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 762, pp. 212-220).—In two herds under investigation, the chronic form of mastitis due to *Streptococcus agalactiae* was detected through bacteriological examination of the secretion from individual cows and controlled by elimination of all infected animals. One herd has been free from infection for nearly 3 yr. and the other for over 4 yr. In another herd, raised under special precautions, *S. agalactiae* was not detected in the secretion of any cow during a period of 9 yr. In a herd where the infected animals were maintained in the same stable with the normal cows and milked last, new cases appeared throughout the period of observation. The results of this study suggest that the contagious form of mastitis can be more quickly eradicated from a herd when the infected animals are immediately disposed of or segregated from the normal cows.

Familial cerebellar hypoplasia and degeneration in Hereford calves, J. R. M. INNES, D. S. RUSSELL, and A. J. WILSON (*Jour. Pathol. and Bact.*, 50 (1940), No. 3, pp. 455-461, pls. 4).—Description is given of the clinical and histological features of five examples of familial cerebellar hypoplasia, arrested development, and degeneration in calves. The pathological changes were found confined to the cerebellar cortex. In cattle the condition appears to be restricted to the Hereford breed and is possibly due to a hereditary factor which has emerged as the result of intensive inbreeding.

Two mortalities among sheep due to infection with species of the Salmonella group of bacteria, D. F. STEWART (*Austral. Vet. Jour.*, 16 (1940), No. 4, pp. 169-172).—One of two mortalities resulting from *Salmonella* infection among sheep was found to be due to *S. bovis-morbificans*, the other to *S. typhimurium*.

Gastrointestinal worm parasitism acquired by sheep during the winter season, D. W. BAKER and J. SAWYER (*Jour. Bact.*, 40 (1940), No. 1, pp. 166, 167).—Observations extending over a period of 5 yr. indicated that sheep and goats while stabled during the winter months were parasitized by nematodes of the various strongyloid types as well as by tapeworms. In the experimental work lambs known to be free from intestinal parasites were transferred to a new environment in which the bedding was contaminated by the feces of adult sheep. The work was carried on during cold winter weather, when the only possible source of infestation was from the infested indoor environment. Group A consisted of five 8- or 9-month-old lambs that had been reared parasite-free, with one being held in the laboratory as a control. Group B was made up of 13 lambs born during December, January, and February and transferred to the infested environment immediately after birth. Fecal examinations were made at weekly intervals. Both groups acquired various species of the superfamilies Strongyloidea and Trichuroidea and tapeworms of the genus *Moniezia*. The first positive fecal examinations were obtained 54 days after birth for group B and 42 days after exposure for group A. The recorded exposure period for group B would appear to be from 14 to 21 days too long, since lambs eat little formed food during early life. These experiments establish that gastrointestinal worm parasites can be acquired by sheep while stabled during the winter months.

A field trial comparing phenothiazine, tetrachlorethylene emulsion, and copper sulphate and nicotine sulphate mixture for the treatment of trichostrongylosis, H. M. GORDON and L. K. WHITTEN (*Jour. Council Sci. and Indus. Res. [Austral.]*, 13 (1940), No. 2, pp. 81-85).—The administration of phenothiazine in doses of 15 gm. for weaners about 5 mo. old and weighing about 20 kg. was highly efficient against *Trichostrongylus* spp. and showed encouraging results against *Oesophagostomum venulosum* and *Chabertia ovis*. "Tetrachlorethylene in doses of 3.5 cc. administered in an emulsion following a dose of copper sulfate was also highly effective against *Trichostrongylus* spp. The after-effects observed following the use of this drug may be of very serious significance when large numbers of sheep are being treated and held in yards and unless a good deal of attention is given to those individuals which become semicomatose and are unable to rise. Under crowded conditions in yards a great many sheep are likely to be suffocated by other sheep falling on them. The mixture of copper sulfate and nicotine sulfate usually prescribed against *Trichostrongylus* spp. gave very poor results. The possible reasons for this are briefly discussed, and further studies on suggested reasons are indicated."

Studies on phenothiazine as an anthelmintic: A comparison of the efficiency of finely and coarsely ground phenothiazine against *Oesophagostomum columbianum*, H. M. GORDON (*Jour. Council Sci. and Indus. Res. [Austral.]*, 13 (1940), No. 2, pp. 85, 86).—In a study of the differences in the anthelmintic efficiency of phenothiazine as related to particle size, a coarsely ground preparation appeared to be less efficient than a finely ground preparation when administered against *O. columbianum* in sheep.

The anthelmintic efficiency of Lentin (Merck) against *Oesophagostomum columbianum*, H. M. GORDON (*Jour. Council Sci. and Indus. Res. [Austral.]*, 13 (1940), No. 2, pp. 87-90).—In the experiment reported, Lentin, a choline derivative (aminoformyl- β -hydroxyethyltrimethylammonium chloride), administered in doses exceeding those recommended by manufacturers against *Strongylus* infestation in sheep was not an efficient anthelmintic for use against *O. columbianum*, *Haemonchus contortus*, or *Trichuris ovis*. Its use was attended with fatal toxic effects, 6 of the 22 sheep died, and a seventh recovered after administration of atropine. These results, obtained in the field, confirm those of other trials carried out under laboratory conditions with sheep in pens and receiving dry feed.

Experiments on the recovery of sheep nematode larvae from pastures, G. P. KAUZAL (*Jour. Council Sci. and Indus. Res. [Austral.]*, 13 (1940), No. 2, pp. 95-106, figs. 2).—A description is given of the technic which has given the best results in the recovery of sheep nematode parasites from pastures. An illustration of the apparatus employed is included. In principle, the isolation relies upon the fact that larvae migrate laterally as well as in a vertical direction from the soil.

The use of oil of citronella for the protection of lambs against blowfly strike, F. G. LENNOX and D. L. HALL (*Jour. Council Sci. and Indus. Res. [Austral.]*, 13 (1940), No. 2, pp. 65-73, fig. 1).—Report is made of studies in which turntable trapping experiments demonstrated the repellency of oil of citronella to blowflies. Insectary tests with a pure population of the Australian sheep blowfly *Lucilia cuprina* showed that the application of solutions of the oil to the fleece surrounding attractive areas on sheep reduced the fly oviposition on these areas. When applied to the tail and purse of lambs at "marking" (tailing and castration), 5- or 10-percent concentrations of the oil in an aqueous soft-soap solution significantly reduced the proportion of animals struck during the subsequent period of healing.

Castration of boars under chloroform anesthesia, W. L. BOYD and H. C. H. KERKAMP. (Minn. Expt. Sta.). (*North Amer. Vet.*, 21 (1940), No. 5, pp. 287, 288).

Diseases of swine, C. NEIVA (*Moléstias dos suínos. São Paulo: Rothschild Loureiro & Co., 1940, pp. 279, figs. 32*).—The affections and parasites of swine met with in Brazil are dealt with in a practical way. Lists of references to the literature relating to the more important are included.

Changes in the dimensions of *Balantidium* from swine upon cultivation, N. D. LEVINE (Univ. Ill.). (*Amer. Jour. Hyg.*, 32 (1940), No. 1, Sect. C, pp. 1-7, figs. 2).—In a study made of the dimensions of *Balantidium* from swine before and after propagation in culture 1,900 individuals from 8 pigs were measured. A significant change in both length and length:width ratio was found after cultivation. In 6 strains the mean length:width ratio became smaller, that is, the individuals became more *B. coli*-like, the reduction varying from 0.10 to 0.53 unit. In 1 of these the shift was from *B. suis*-like to definitely *B. coli*-like dimensions. In 2 other strains the protozoa became more slender and *B. suis*-like, the length:width ratios increasing from 0.10 to more than 0.18 unit.

Pulmonary edema in hogs, L. E. STARR. (Ala. Polytech. Inst.). (*Vet. Med.*, 35 (1940), No. 6, p. 359).

Vesicular exanthema of swine, B. B. WHITE (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 762, pp. 230-232, 237, figs. 5).

Results of feeding zinc to pregnant mares and to mares nursing foals, R. GRAHAM, J. SAMPSON, and H. R. HESTER. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 760, pp. 41-47, figs. 5).—Experiments conducted with a view to determining the possible relation of zinc to an affection of suckling colts on a farm located near a zinc smelter at Depue, Ill. are reported. It was thought that zinc from fumes of the smelter plant had been deposited on the grass and that the milk of the mares, feeding thereon, contained amounts sufficient to poison the colts. Thus far, no experimental evidence has been obtained through feeding zinc lactate to six pregnant mares or to mares nursing foals, over a period of 2.5 yr., to show that the fatal illness of two colts was due to zinc poisoning. Zinc in the amounts of 54 and 540 gr. of zinc sulfate, respectively, fed daily to pregnant mares and mares nursing foals failed to induce symptoms in either the mares or the suckling foals. These preliminary results of zinc feeding are in agreement with the findings of Thompson, Marsh, and Drinker (*E. S. R.*, 57, p. 195).

Studies with equine streptococci.—I, A survey of beta-haemolytic streptococci in equine infections, P. L. BAZELEY and J. BATTLE (*Austral. Vet. Jour.*, 16 (1940), No. 4, pp. 140-146).—Four hundred and fifty-seven strains of group C Lancefield streptococci (β -hemolytic), recovered from 415 cases of serious and typical equine diseases, were examined by colony morphology, serology, and biochemical reactions. These strains have been classified broadly into a scheme that may be incorporated into the group plan of Lancefield. There was a complete agreement between the serological and biochemical reactions of the types found. The epidemiology of the strains is discussed briefly.

Host range of equine encephalomyelitis: Susceptibility of the North American cottontail rabbit, jack rabbit, field vole, woodchuck, and opossum to experimental infection, J. T. SYVESTON and G. P. BERRY (*Amer. Jour. Hyg.*, 32 (1940), No. 2, Sect. B, pp. 19-23).—Observations made of the susceptibility to infection by the virus of equine encephalomyelitis are reported for these animals, all of which have natural habitats in close proximity to equines during the time of year when equine encephalomyelitis occurs. In the limited ex-

perience, the opossum was refractory to infection by both the eastern and western types of the virus. The field vole was shown to have about the same order of susceptibility as the guinea pig, mouse, or Richardson ground squirrel. The woodchuck was less susceptible than any in the foregoing group of animals, but brain-to-brain passages of the virus were readily made, and the results suggest that the field vole and woodchuck may act in nature as reservoir hosts for the disease. The least susceptible of the animals tested were the wild rabbits, and although both genera (*Sylvilagus* and *Lepus*) gave definite evidence of infection following intracerebral inoculation, the virus could not be maintained by brain-to-brain passage. Nineteen references are listed.

A study of birds and mosquitoes as hosts for the virus of eastern equine encephalomyelitis. W. A. DAVIS (*Amer. Jour. Hyg.*, 32 (1940), No. 2, Sect. C, pp. 45-59).—Studies conducted with 17 species of mosquitoes revealed that 5 native to Massachusetts, namely, *Aedes vexans*, the salt-marsh mosquito, the brown salt-marsh mosquito, *A. atropalpus*, and *A. triseriatus*, and a laboratory strain of the yellow-fever mosquito could transmit the virus of eastern equine encephalomyelitis from infected birds or mammals to other animals. No transmissions were obtained with mosquitoes of other genera (*Culex*, *Mansonia*, and *Anopheles*). It is deemed likely that most mosquitoes of the genus *Aedes* can serve as vectors of the virus in the laboratory but that in nature the importance of the different species is determined by ecologic factors, including the feeding habits of the insects, their flight range, abundance, and perhaps seasonal variations. If mosquitoes are the natural vectors of equine encephalomyelitis, *A. vexans* was probably the most important vector of the infection in an epidemic that occurred in New England in the summer of 1938, a study of which is said to have supported the postulate of Ten Broeck (*E. S. R.*, 83, p. 819) that birds act as reservoir hosts for the virus of equine encephalomyelitis. Experimental evidence showed that birds (English sparrows, pigeons, cowbirds) could be infected with virus by the bite of infected mosquitoes, and that infected birds may serve as a source from which mosquitoes may become infected. These results do not, of course, prove that birds are the natural reservoir of equine encephalomyelitis, but added to the epidemiologic studies it is deemed likely that they do constitute a reservoir from which mosquitoes become infected with virus which they, in turn, pass on to horses, human beings, birds, or other animals. Thirty-nine references are included.

Indication of the presence of the virus of equine encephalomyelitis in brain of ground squirrel. R. GWATKIN and T. MOORE (*Canad. Jour. Compar. Med. and Vet. Sci.*, 4 (1940), No. 3, pp. 78-82).—Examination made during the summer of 1939 of the brains of 127 Richardson ground squirrels (*Citellus richardsoni*) by intracerebral inoculation of guinea pigs with 1:20 of brain suspension of western virus resulted in the finding of 10 brains that were contaminated, causing the death of injected animals.

Anaphylactic reactions following the use of chick embryo equine encephalomyelitis vaccine. W. R. WOLFE and B. F. TRUM ([*War. Dept. U. S.*], *Off. Surg. Gen., Vet. Bul.*, 34 (1940), No. 3, pp. 226-228, fig. 1).—Report is made of reactions of an anaphylactic nature that occurred in 3 horses and a mule out of the 1,014 horses and mules at Fort Robinson, Nebr., vaccinated with chick embryo vaccine against equine encephalomyelitis.

A simple and practical test for the diagnosis of osteoporosis in horses. V. D. RATNAM (*Indian Jour. Vet. Sci. and Anim. Husband.*, 10 (1940), No. 1, pp. 115, 116, pl. 1).

Canine rabies vaccination: An experimental study of the efficacy of the single subcutaneous injection method with phenol treated vaccine, (I. N.

LEACH and H. N. JOHNSON (*Amer. Jour. Hyg.*, 32 (1940), No. 2, Sect. B, pp. 46-53).—Natural resistance of unvaccinated dogs to artificial intramuscular inoculation with massive doses of street rabies virus was demonstrated. Of 105 vaccinated dogs, 24.8 percent died of rabies after test virus inoculation, while 55 percent of 120 control animals succumbed to the disease. The mortality among control animals was significantly higher than that observed among vaccinated dogs. It is concluded from this study that a single subcutaneous vaccination with phenol-treated vaccine affords some protection against subsequent experimental exposure to rabies street virus. Thirteen references are listed.

Preventing poultry diseases, M. W. EMMEL. (Fla. Expt. Sta.). (*Fla. Grower*, 48 (1940), No. 9, p. 14).

[Mortality among laying fowl], F. B. HUTT. (Cornell Univ.). (*Harper Adams Util. Poultry Jour.*, 24 (1938-39), No. 11, pp. 395-399).—The mortality in 2 New York State laying tests that commenced in 1931 was 22.4 percent of 9,893 birds entered. Of the 1,922 cases passed upon, 38.4 percent were due to neoplasms, 25.3 to disorders of reproduction, 11.2 to prolapse of oviduct, 5.9 to kidney diseases, 3.4 to impactions, alimentary tract, 2.4 to internal hemorrhage, and 13.4 percent to other causes.

A technique for the intravenous inoculation of chick embryos, E. A. EICHORN. (U. S. D. A.). (*Science*, 92 (1940), No. 2385, pp. 245, 246, fig. 1).—Description is given of a simple technic developed for the intravenous inoculation of chick embryos. Employing this technic, there had been 32 passages from egg to egg in series at the time of writing, and the mortality rate due to hemorrhage in faulty manipulation had been approximately 30 percent. There is thought to be no reason why this mortality rate cannot be considerably reduced with improved technic.

Preliminary report on the propagation of the fowl-leucosis virus on chick embryos by intravenous inoculation, W. J. HALL, C. W. BEAN, and M. POLLARD. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 762, p. 247).—The authors, using the intravenous technic described by Eichhorn, as above noted, obtained marked lesions in the embryos which became infected through inoculation. "Chick embryos 11 days of age were inoculated intravenously with 0.05 cc. of heparinized leukemic chick blood. Daily examination of blood smears from the inoculated embryos was made after a few days of incubation. The appearance of increasing numbers of hemocytoblasts in the peripheral blood indicated the onset of leucosis. The disease developed in the embryo in 6 to 8 days after inoculation, at which time the embryo became morbid or died. Embryo infection was confirmed in every case by inoculation of susceptible chicks with embryo blood. These chicks then developed typical cases of leucosis in about the same time as those inoculated with leukemic chick blood. Approximately 3.5 percent of embryos inoculated with leucotic chick blood developed leucosis. Two groups of embryos came down with leucosis when inoculated with second-passage embryo blood."

The effect on the growth-rate of young chickens of infections of the tapeworm *Hymenolepis carioeca*, G. W. LUTTERMOSER. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 7 (1940), No. 2, pp. 74-76).—The feeding of 1,000 cysticercoids of *H. carioeca* to each of twenty 2- to 4-week-old Rhode Island Red chicks did not seem to retard their growth rate when kept on a well-balanced diet.

Tests with miscellaneous substances for the removal of tapeworms from chickens, P. D. HARWOOD and J. E. GUTHRIE. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 762, pp. 248-253).—A review is presented in connection with 51 references to the literature, and experiments conducted with 223 substances and 27 mixtures as anthelmintics for the removal of tapeworms from

chickens are reported. Of the materials tested, only lead arsenate exhibited any promise as a poultry taeniocide, and in carefully controlled tests in which chickens experimentally infected with *Railletina cesticillus* were used, it was found that lead arsenate in effective doses is too toxic to be recommended for general use for this purpose. The details of the experiments conducted are given in tables.

A preliminary note on the efficiency of phenothiazine against some poultry helminths, F. H. S. ROBERTS (*Austral. Vet. Jour.*, 16 (1940), No. 4, pp. 172-174).—The administration of phenothiazine in the commercial form known as Thiox was tested against certain poultry helminths at dose rates of 0.4 gm. per pound body weight, 1 gm. per pound body weight in a single dose, and 1 gm. per pound body weight divided into three equal portions and administered on 3 successive days. "At all these dose rates the drug was ineffective against *Cheilosporira hamulosa*, *Railletina tetragona*, and *Hymenolepis caritoca*. A dose rate of 1 gm. per pound body weight in a single dose gave a moderate efficiency against *A[scaridia] galli* (56.2 percent) and indicates that better results may be secured with a higher dose rate. The drug appears to have a promising anthelmintic action against *H[eterakis] gallinae*. There are, then, indications from these trials that phenothiazine may prove of some value against *A. galli* and *H. gallinae* if used in large doses and given in the food, a line of treatment to be investigated in the near future."

The toxicity of various copper compounds and mixtures for domesticated birds, E. M. PULLAR (*Austral. Vet. Jour.*, 16 (1940), No. 4, pp. 147-162, figs. 2).—When copper preparations were fed in varying amounts to fowls, the minimum lethal doses determined, expressed in grams per kilogram live body weight, were as follows: Single crystal of copper sulfate 0.9, powdered copper sulfate from 0.3 to 0.5, copper sulfate in a 4-percent solution from 1 to 1.5, copper sulfate when mixed with twice its weight of sodium chloride from 0.3 to 0.5, and copper carbonate 0.9. The copper sulfate in the dry residue of bordeaux mixture was only feebly toxic, and that in bordeaux mixture solution was completely nontoxic for fowls. The question of the availability and absorption of copper is discussed in the light of these results.

On the resistance of chickens to the intestinal nematode *Ascaridia lineata* (Schneider) following immunization, L. L. EISENBRANDT and J. E. ACKERT. (Kans. Expt. Sta.). (*Amer. Jour. Hyg.*, 32 (1940), No. 1, Sect. D, pp. 1-11).—In the two experimental lots of chickens reported upon, consisting of nine subgroups, it was shown that White Leghorn chickens do not readily develop an immunity to the intestinal nematode *A. lineata* following intracardial injections of sterile extracts of this nematode. In some instances, however, a parenteral immunity apparently affected the intestinal nematodes, since three of the nine groups of chickens artificially immunized were significantly protected against *A. lineata*. "An artificially acquired general body immunity, as evidenced by the many positive precipitin ring tests made from the serums of the injected chickens, usually, but not always, failed to protect the host from *A. lineata*. In six of nine groups of chickens, the nematodes were not significantly shorter than those in the control chickens. The intestinal nematode *A. lineata* failed to stimulate chickens to develop an acquired general immunity. This was substantiated by the fact that all serological data were negative for the noninjected control birds. The type and the quantity of antigen and the age at which the injections of antigen were initiated did not play important roles. Titers for the positive precipitin tests were low. They were not correlated with the length or the numbers of *A. lineata* in the particular host involved."

A list of 24 references to the literature is included.

Some observations on the viability of Doyle's disease virus of fowls under different conditions, S. G. IYER (*Indian Jour. Vet. Sci. and Anim. Husband.*, 10 (1940), No. 1, pp. 81-87).—Results of experiments conducted with reference to the viability of the virus of the so-called Doyle's disease of fowls under laboratory conditions, with a review of the literature on the subject, are presented. The virus used in the tests was mostly contained in organs such as the liver and spleen. After aging at room temperature of about 17° C., it remained viable for 21 days. At 37° the virus did not die after 24 days but was inert after 31 days. Saline emulsion of buccal swabs from fowls dead of the experimental disease gave variable results. It remained viable at 37° for 3 days but was found to be dead after 4 days. Exposure to direct sunlight for 1 hr. had no lethal effect on the virus.

Successful cultivation of avian plasmodia in duck embryos, F. WOLFSON (*Amer. Jour. Hyg.*, 32 (1940), No. 2, Sect. C, pp. 60, 61).—In the study reported, three species of *Plasmodium*, namely *P. cathemerium*, *P. elongatum*, and *P. lophurae*, were successfully cultivated in duck embryos. This is the first report known of the successful cultivation of any species of the genus in bird embryos.

Sinusitis in turkeys, L. HAET (*Austral. Vet. Jour.*, 16 (1940), No. 4, pp. 163-168, fig. 1).—A description is given of a disease which appears to be specific for turkeys and is characterized by inflammation of the infraorbital sinuses. "Although in the field it behaves like a highly infectious disease, experimentally it has been possible to transmit it only by direct injection of exudate into the sinus. Infection by contact, ocular and nasal instillation, and atomization gave negative results. The time elapsing between injection and the appearance of symptoms varied from 3 to 12 days. The causal agent was not determined, but appears most likely to be a filtrable virus, although two attempts to pass it through an Elford collodion membrane were unsuccessful. The causal agent persisted in vivo for 11 mo., the maximum period tested. Sinus content produced the disease after being held in glycerine saline for 14 days at 36° C., but not after being held for 2 mo. After being held in saline at 36° for 14 days it failed to produce the disease. The disease was set up by injection into each sinus of 1 cc. of a 1 in 10,000 dilution of exudate. Birds which had recovered from one attack were immune to reinfection, but attempts to produce immunity artificially were unsuccessful. Injection into affected sinuses of small amounts of 2 to 5 percent silver nitrate solution appears to be the best and cheapest method of treatment, providing it is carried out in the early stages and care is taken that the solution does not enter the subcutaneous tissues."

Post-mortem autodigestion of the intestinal mucosa of the turkey, L. E. ROSENBERG. (Univ. Calif.). (*Stain Technol.*, 15 (1940), No. 2, pp. 53-56, figs. 7).

A note on the development of acquired immunity in avian malaria, R. HEGNER (*Amer. Jour. Hyg.*, 32 (1940), No. 1, Sect. C, pp. 24-26, fig. 1).—In a study made of a canary infected with the Hartman strain of *Plasmodium cathemerium* the rate of destruction of malaria parasites was found to increase progressively and rapidly during the rise in the number curve. There is no sudden appearance of resistance at the crisis. Infections in monkeys and man appear to be similar to those in birds in this respect.

Apoplexy in a canary, A. J. DURANT and H. C. McDUGGLE. (Mo. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 762, pp. 265, 266, fig. 1).

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Indiana Station] (*Indiana Sta. Rpt.* 1939, pp. 13, 34-38, 39-41, 42-45, 77, 78, figs. 5).—This report notes work on electric pig brooders, and a study of the use and practicality of

electric heat for warming drinking water for livestock, both by T. E. Hienton and J. M. Fore; mechanical refrigeration of eggs, by Hienton, Fore, and E. R. Menefee; use of electric energy in brooding, by Hienton and Fore; precooling of fresh fruits in refrigerator cars, by Hienton and K. I. Fawcett; electric soil sterilization, by Hienton and J. B. Greiner; codling moth control with electric traps, by G. E. Marshall and Hienton; plow trash shields, by R. H. Wileman; Canada thistle and similar weed-control implements, by Wileman and O. C. Lee; low corn-cutting demonstrations, and rubber tires for tractors and farm implements, both by Wileman; seed-corn drying, by Wileman and A. J. Ullstrup; poultry-house ventilation, by I. D. Mayer and C. W. Carrick; and combined harvester thresher, atmospheric corrosion of wire and wire products, experimental dairy barn, field ensilage harvesting, and power-driven manure spreader, all by Mayer.

Range improvement through conservation of flood waters.—A report of progress, O. W. MONSON and J. R. QUESENBERRY. (Coop. U. S. D. A.). (*Montana Sta. Bul. 380 (1940), pp. 20, figs. 16*).—This bulletin reports data on the measurement of the actual run-off from small watersheds, a determination of the extent to which this run-off can be recovered and used, and an investigation of the possibilities of range vegetation by the conservation and use of such run-off water. As a means for run-off measurement, a 4-ft. Parshall flume was placed at the mouth of a coulee receiving the run-off from about 2 sq. miles of watershed. This flume was equipped with an automatic water-stage recorder so controlled by a float as to operate only during actual water flow.

Water passing through the coulee was prevented from following a large gully to the river by an earth dam, or dike, 3 ft. high and provided with five 20-ft. spillways for distribution of the water. In three areas three methods of utilizing this water were tested. The first, described as free flooding, but including the use of two shallow contour ditches to prevent localization of the water in swales and low spots, appeared to be adapted to lands having slopes up to 5 percent. The second control procedure, described as "controlled flooding" and involving a system of dikes at right angles to the slope and almost on the contour, was designed to direct the water back and forth across the slope. Dikes 16 in. high, graded 0.05 percent, and about 1,200 ft. in length were used. Natural revegetation of both dikes and borrow pits is progressing well. Of these experiments it is stated that the method of meandering flooding is adapted to slopes of less than 1.5 percent, but for steeper slopes the contour spreading ditches should be used. On a third area, having a slope of less than 1 percent, a procedure described as ponding or check flooding was tested. Dikes from 12 to 14 in. high backed up the water over strips 100 ft. wide. Contour dikes at contour intervals of 0.8 ft. were provided with riprapped spillways about 100 ft. apart to prevent overtopping. Dikes and spillways were successfully seeded to brome grass. Crested wheatgrass also gave good results and responded well to flood irrigation, though its growth was less heavy than that of the brome grass. This method gave better penetration of the water than did the mere flooding over of the surface, but it concentrated the available water on a smaller area of land.

Winter pasture grazing load on the area treated in these experiments was increased from 200 head, requiring supplementary feeding with hay and cottonseed cake, to 300 head, requiring no hay and but little cottonseed cake. It is believed that the results have more than justified the expense.

Surface water supply of Hawaii, July 1, 1937, to June 30, 1938 (*U. S. Geol. Survey, Water-Supply Paper 865 (1940), pp. IV+122*).—This report presents measurements of stream and ditch flow in the Territory.

Experiments with electric water heaters for dairy farms, J. M. FORE and T. E. HENTON (*Indiana Sta. Bul. 447 (1939), pp. 12, figs. 11*).—The efficiencies of 15 heaters, 11 of the tank type and 4 portable immersion units, were tested under various conditions in the heating of water for cleansing dairy utensils. The average final temperature attained was 174.9° F., as against the 165° to 170° considered necessary for proper washing. The most important single efficiency factor was that of the insulation, the tank heaters showing an average efficiency of 77.7 percent, as compared with the 62.8 percent average efficiency of immersion heaters operated in uninsulated pails. Of the immersion heaters, 2 used in uncovered, uninsulated pails showed an average efficiency of 77.85 percent. The same 2 heaters in pails placed in heat-insulating materials in a box and provided with an insulated cover operated at an average efficiency of 88.5 percent. Immersion heaters used in uninsulated water containers were more efficient when of 1 kw. or greater wattage.

Electric water heaters of from 3- to 15-gal. capacity are practical for use on Indiana dairy farms producing bulk milk where electric service is available. Five of the tank-type heaters, equipped with heating elements of 2,000 w. or more, heated 5 gal. of water from tap temperature to 170° in less than 1 hr. Three immersion heaters and 1 small tank heater heated 3 gal. of water to the same temperature in less than 1 hr. Such heaters may be connected before milking is started to provide from 3 to 5 gal. of hot water when milking is finished. Of the tank heaters of low wattage (from 250 to 1,000), 3 equipped with thermostats required more than 1 hr. to heat water to 170°. These heaters, because of the thermostat control, are operated continuously. They will supply from 8 to 15 gal. of hot water when needed.

AGRICULTURAL ECONOMICS

[Papers and notes on agricultural economics] (*Jour. Farm Econ., 22 (1940), No. 3, pp. 533-620, 633-646, figs. 2*).—Included are the following papers: Time Preference and Conservation, by A. C. Bunce (pp. 533-543) (Iowa Expt. Sta.); Supply Schedules—"Long-Time" and "Short-Time", by R. L. Mighell and R. H. Allen (pp. 544-557) (U. S. D. A. and Univ. Ky.), having for its purpose "to re-examine the supply-schedule concept and to indicate some of the bridges to be built between the earlier supply-response studies and the type of long-time response study that seems needed for long-range price forecasting and long-time planning"; Training and Recruitment of Agricultural Economic Personnel—IV, A Training Program, by T. Cooper (pp. 558, 559) (Univ. Ky.), V, For Public Service, by J. D. Black (pp. 560, 561), VI, An Administrator's View, by F. F. Hill (pp. 562-566) (Cornell Univ.), and VII, The Government Service as a Career, by C. F. Sarle (pp. 567-569) (U. S. D. A.) (El. S. R., 83, p. 834); Dr. Schultz on Farm Management Research, by J. D. Black (pp. 570-580), being comments on the paper entitled Theory of the Firm and Farm Management Research (El. S. R., 82, p. 400); Part-Time Farming Research, by L. A. Salter, Jr., and L. F. Diehl (pp. 581-600) (U. S. D. A.), analyzing 24 research reports to ascertain certain aspects of part-time farming and to assist in the orientation of future research; Trading in Wheat and Corn Futures in Relation to Price Movements, by P. Mehl (pp. 601-612) (U. S. D. A.), a study of the relationship between daily trading of various classes of traders and between their trading and daily price changes of Chicago wheat and corn prices, August 1937 to June 1938; and Economic Phases in Soil Erosion Control, by P. E. McNall (pp. 613-620) (Univ. Wis.).

The following notes are included: Suggestions for a Sample Census of Agriculture in the West, by M. Clawson (pp. 633-637) (U. S. D. A.); Social Aspects

of Land Use in Delaware, by R. O. Bausman (pp. 637-640) (Univ. Del.); and Financing of Agriculture in Russia, by V. Katkoff (pp. 640-646) (Univ. Calif.).

[Abstracts of papers on agricultural economics] (*Assoc. South. Agr. Workers Proc.*, 41 (1940), pp. 41-43, 46-48, 94, 95, 106-108, 120-128, 130-132, 164, 165, 166, 167, 168-178, 208-211, 220-225).—Included are abstracts of papers presented at the forty-first annual convention of the Association of Southern Agricultural Workers at Birmingham, Ala., February 7-9, 1940, on agricultural adjustment, land-use planning, land classification, farm labor and tenancy, lease provisions, marketing different farm products, farm enterprises, farm and forest cooperatives, forest management, soil conservation, etc.

[Investigations in agricultural economics by the Indiana Station, 1938-39] (*Indiana Sta. Rpt. 1939*, pp. 81-85, 103, figs. 3).—Brief statements of findings are included for studies of economy of pastures and land use on different soils, both by F. V. Smith; profitable farm practices in central Indiana, economical farm power, and economy of combines, all by J. C. Bottum; successful farms in northwestern Indiana, movements of feeder livestock, and farm buildings, all by L. S. Robertson; costs and returns on intensive crops in northern Indiana, by Robertson and M. G. Smith; crop returns on different soils, by Bottum and F. V. and M. G. Smith; motortrucks, by T. K. Cowden; costs of farm machinery, by O. G. Lloyd and E. L. Bulz; landlord-tenant relations, by Lloyd and J. R. Hays; and marketing eggs and the retailing of eggs in Indianapolis, both by E. R. Menefee.

Current Farm Economics, [August 1940] (*Oklahoma Sta., Cur. Farm Econ.*, 13 (1940), No. 4, pp. 77-106, figs. 10).—In addition to the usual review of the agricultural situation and tables on prices, etc., the following articles are included: How Land-Use Planning Operates in Oklahoma, by H. A. Miles (pp. 83-89) (U. S. D. A.) (E. S. R., 83, p. 689); Guideposts for Farmers' Analysis of Hog Prices, by G. P. Collins (pp. 90-98); and The Principle of the Graduated Land Tax, by R. T. Klemme (pp. 99-103).

Foreign Agriculture, [August-September 1940] (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr.*, 4 (1940), Nos. 8, pp. 459-507, figs. 16; 9, pp. 511-574, figs. 10).—No. 8 includes articles on Netherlands Agriculture and the War, by P. G. Minneman and C. L. Davis (pp. 459-492), discussing agricultural production and trade, wartime agricultural control measures, and the effects of the World War and the present war, and on The Hog Industry in Argentina, by P. O. Nyhus (pp. 493-507), discussing production, marketing, consumption and trade, and the wartime prospects. No. 9 is an article on Agriculture of the Netherlands Indies, by W. Ladejinsky (pp. 511-574), dealing with physical background, the people and the land, economic welfare, agricultural practices, agricultural production, effect of the world depression on the islands, reconstruction, and the foreign trade.

[Agricultural law] (*Internat. Inst. Agr. [Roma], Internat. Bul. Agr. Law*, No. 1 (1940), pp. [2]+114).—This first number includes articles on All-Risk Wheat Crop Insurance in the United States of America Under the Federal Crop Insurance Act of 1938, by R. H. Shields and H. Donoho (pp. 4-19) (U. S. D. A.); The New Romanian Civil Code and Agrarian Legislation, by V. Bulgaru (pp. 19-33); The Dutch Law on Agricultural Leases, by C. M. O. van Nispen tot Sevenaer (pp. 33-46); Emphyteusis in Modern Greek Law, by A. D. Sideris (pp. 47-53); and Review of the Agrarian Jurisprudence of the Italian Court of Cassation, by A. Azara (pp. 53-68); notes on Agrarian Law in Italy (Legislation, Science, and Teaching), by P. Germani (pp. 69-80), and The Evolution of the Right of Landownership in Yugoslavia (pp. 80-82); and abstracts of the Act of December 26, 1939 [Spain] setting up bases for the colonization of large

extensions of land, the act [Italy] providing for the colonization of the large landed property in Sicily, and measures [Switzerland] against speculation in land overindebtedness.

The farmer in the groupistic regime, H. C. TAYLOR (*Jour. Land and Pub. Util. Econ.*, 16 (1940), No. 3, pp. 253-261, figs. 2).—The groupistic struggle in the United States of industry, labor, and agriculture is discussed.

"The approach to the solution of this problem would seem to lie in the substitution of intergroup cooperation for intergroup conflict, the substitution of statesmanship economics for groupistic economics, the substitution of the general welfare as the goal instead of seeking to benefit one group at the expense of another. . . . This calls for a political economy which will encourage balanced abundance and parity real incomes for comparable services. It is a function of government to respond to this need by discouraging selfish groupistic policies and by developing a truly national economic policy."

Accounting for farm costs: A proposed approach, J. W. DAVAVULT (*Thesis, Columbia Univ., New York, 1939, pp. 151*).—This doctoral thesis is "an attempt to examine the nature of farm costs and their allocation with reference to the general farm from a theoretical economic and accounting point of view, and to suggest a method of approach similar to factory cost accounting procedure." The valuation of farm real estate, farm personality, departmentalizing the farm, and the allocation of farm costs are discussed.

The economic history of live stock in Ireland, J. O'DONOVAN (*Dublin: Cork Univ. Press; London and New York: Longmans, Green and Co., [1940], pp. [4]+460, [figs. 12]*).—The principal topics treated in this book are livestock in Ireland to 1845, the industry since the famine, and State schemes for the improvement of livestock in Ireland.

Possibilities for cattle income, R. T. BURDICK (*Colorado Sta. Bul. 460 (1940), pp. 37*).—Included in this analysis of factors affecting income are tables showing (1) the effect of death losses with different percentages of calf crop upon number of heifers or steers remaining at the end of one or more years per 100 cows in the breeding herd; (2) upon number of heifer calves saved at the end of first year for replacements; (3) upon number of cows for sale; (4) upon percentage change in sale weight on 375-lb. base for calves and 700-lb. base for yearlings; (5) with different percentages of calf-crop replacement and death losses, (a) the possible number of calves and yearlings available for sale and (b) the pounds of calf, yearling, and cow sales from 100 breeding cows; (6) size of herd to maintain 100 breeding cows and pounds and value of calf, yearling, and cow sales when heifers enter the herd at 2 and 3 yr. of age; (7) effects of sale price on income from cow sales; and (8) cost per 100 lb. of beef with different first-year costs and production.

Corn in the development of the civilization of the Americas, L. O. BERCAW, A. M. HANNAY, and N. G. LARSON (*U. S. Dept. Agr., Bur. Agr. Econ. Bibliog. 87 (1940), pp. IV+195*).—A selected and annotated bibliography including over 400 references.

Cotton production in the United States: Crop of 1939, H. J. ZIMMERMAN (*Washington: U. S. Bur. of the Census, 1940, pp. II+37*).—Tables show the United States production of cotton and linters by years from 1899 to 1939 and by States the production of cotton and linters and cotton ginned to specified dates 1936-39; average gross weight of several kinds of bales and number and gross weight of square bales 1937-39; number of ginneries 1939 and quantity of cotton, exclusive of linters, ginned 1936-39 by counties; and cotton ginned to specific dates.

Flax-management practices in Imperial Valley, with world statistics. W. SULLIVAN, H. L. LANDERMAN, and G. A. CARPENTER (*California Sta. Bul.* 641 (1940), pp. 38, figs. 5).—A brief history of flax in California is given. Analysis is made of the cost and input factors in the Imperial Valley and the processing, marketing, etc., of flax and flax products. An appendix includes world flax statistics.

An analysis of peanut-cotton-hog farm businesses in a depression year. F. L. UNDERWOOD (*Virginia Sta. Tech. Bul.* 67 (1940), pp. 103, figs. 4).—Records for 1932 were obtained by the survey method for 699 farms in southern Nansemond County. An analysis is made of the receipts, expenses, profits, capital, land use, crops, farming practices, prices received for peanuts and cotton, factors affecting crop yields, numbers and value of livestock, hog production and disposal, pork prices, factors affecting hog production, the effect on income of rates of production, index of prices, labor efficiency, size of business, combination of enterprises, personal factors, etc.

The average income available for the use of capital and operator's labor was —\$25, and the average labor income —\$220. The unfavorable price situation and unfavorable weather during the year were the most important factors affecting the general level of income. Variations in prices for products sold, in amounts of productive work per man, and in production rates of crops and livestock, particularly hogs, were the most important factors affecting the income of different farms. Variations in prices were due chiefly to quality and volume of products. Labor efficiency generally was associated with size of business, but large capital investment tended to offset the advantages of relatively large business. Relatively high production of crops and hogs was profitable if obtained economically. Due to the general situation size of business was inversely related to income. Increased peanut acreage was profitable if yields were high and quality good. The addition of hogs was the most profitable way to increase size of business. Increased corn production was profitable only through conversion into pork. Increased cotton acreage was associated with reduced income. Personal factors were important only in so far as they were associated with sound farm management. Of the total income for the farms, 34.6 percent was products used by the household, and on over one-fourth of the farms such products constituted 50 percent or more of the total income. As the proportion increased all important measures of farm business efficiency, including labor earnings, declined. "The outstanding effect of the depression was to make improvements in rates of production and labor efficiency cost more than they were worth at prevailing prices for farm products unless such improvements could be achieved with little or no cash outlay, either by reorganization of the farm layout or by the addition of hogs to the business."

Economics of flue-cured tobacco farming. W. L. GIBSON, JR. (*Virginia Sta. Tech. Bul.* 66 (1940), pp. 135, figs. 3).—This study was a repetition in less detail of the study previously noted (E. S. R., 81, p. 857) to determine the effects of the A. A. A. program begun in 1933 upon farm operations and farm income and to study the farm organization from the standpoint of a different price level and different weather conditions. For 1936, 535 records were used in the main analysis. The weather conditions in 1936 were excellent for tobacco, while those in 1933 were relatively unfavorable. The average price for tobacco in 1933 was \$13.67 per 100 lb., while that in 1936 was approximately twice as much. Analyses similar to those in the previous study were made, and findings for the 2 yr. are compared.

The total average capital investment per farm in 1936 was \$6,718, an increase of 43 percent from 1933. Total receipts averaged \$1,860, nearly double those

in 1933. Farm expenses averaged \$945 in 1936, average total farm labor income was \$567, and the average operator's income was \$444 plus \$482 worth of properties. Landlords return averaged 8.3 percent. Croppers averaged \$409 above their expenses plus \$278 for properties. The average size of farm increased 11.3 acres from that of 1933. The acreage of tobacco was reduced 1 acre per farm, that of corn 1.3 acres, and that of wheat 1 acre. The acreage of hay was increased from 4.3 to 11 acres, that of open-permanent pasture from 8.6 to 14 acres, and the number of animal units per farm from 6.03 to 6.76. Farms normally producing high yields of good quality tobacco reduced their acreage in tobacco less than the average. Farms not cooperating with the Soil Conservation Service made little change in land use during the period. Increased erosion reduced size of farm business by reducing acres of crops grown, especially tobacco, and shifting from intensive crops to those of an extensive nature. Rye as a cover crop for tobacco lands and green manure crops on other lands increased. Significant increases occurred in the use of manure on tobacco lands, of commercial fertilizers on both tobacco and other lands, and of lime. The most important business analysis factors determining labor income in order of importance were tobacco price, productive-man-work units, production index, and work units per man.

Estimated gross cash income from the sale of agricultural products from the farm and from Agricultural Adjustment Administration payments for Ohio farms, by counties—1939, P. P. WALLRABENSTEIN and J. I. FALCONER (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 130 (1940), pp. [1]+11*).—This continues the series (*E. S. R., 83, p. 406*).

Fields of current State planning board activity, C. W. ELIOT (*Natl. Resources Planning Bd. Cir. 8, rev. (1940), pp. [2]+77*).—The current State planning board activities are classified according to function.

Relationship of character of farming units to land management in two townships in Indiana, J. R. HAYS. (Coop. U. S. D. A.). (*Indiana Sta. Bul. 450 (1940), pp. 20, figs. 7*).—For Deer Creek Township, Cass County, in the northern part of the State, an analysis is made of the size and tenure of operating units; location of tracts in relation to the farmstead; changes in ownership and operators since 1915, and the relationship of physical characteristics and land use to the changes and of distance from farmstead to size of fields, physical characteristics, land use, etc.; and the effects of division of farm units on land management. In Johnson Township, Knox County, in the southwestern part of the State, analysis is made of size, tenure, and location of tracts.

In Deer Creek Township only 55 percent of the operating units consisted of a single tract under one ownership, 25 percent of from 2 to 4 separately located tracts, and 25 percent involved from 2 to 4 separate owners. In Johnson Township less than 50 percent of the operating units consisted of 1 tract under a single owner, 46 percent of the farms consisted of from 2 to 6 separate tracts, and 40 percent involved from 2 to 5 owners. In Deer Creek Township the ownership of 15 percent of the units and the operators of 25 farms had not changed since 1915. The ownership of 85 percent of the units had changed from 1 to 8 times. On 4.5 percent there had been more than 10 different operators. Where operators changed most frequently the tracts on the average were smaller and less productive and had a higher percentage of cultivated lands and small grain. Little difference existed in the cropping program on the tracts at different distances from the farmstead, but about 5 percent more of the land was in cultivated and grain crops and less in woods, waste, and idle lands on distant tracts than on the farmsteads. The home tracts received more lime and manure. Rented por-

tions of part-owned farms had 6 percent more of the land in cultivated and small grain crops and 11 percent less in sod and open permanent pasture and received less manure and slightly less lime than owned portions.

Land-ownership patterns in relation to land types in Dickinson County, Michigan. I. F. SCHNEIDER (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 1, pp. 46, 47).—This survey revealed a marked change in the types of landownership between the years 1916 and 1937. "If the present trend continues, it is reasonable to assume that more than 75 percent of Dickinson County will have passed into State ownership and administration within the next 20 yr."

Farm organization and management in the Colebrook area, H. C. WOODWORTH and A. HARGAS (*New Hampshire Sta. Bul.* 322 (1940), pp. 40, figs. 21).—The data for this project, initiated in 1933, were obtained by a fieldman who made notes on the methods used in field operations and chore work, collected input and output data and financial records, and mapped farms, and from the financial statements for 38 farms for the year ended November 1, 1934. The area and its agriculture are described. Analysis is made of the financial reports, the dairy and field operations, labor requirements, and seasonal distribution for different crops and dairying. Methods of working out revised plans for operation of the farms are discussed and illustrated.

The experimental agricultural conservation program in Licking County, Ohio: A study of the results in 1939. F. L. MORISON. (Coop. U. S. D. A.). (*Ohio State Univ. Dept. Rural Econ. Minicop. Bul.* 129 (1940), pp. [1]+23).—In 1938 the U. S. D. A. Agricultural Adjustment Administration initiated an experimental agricultural conservation program in Licking County based on a method of measuring the rate of soil improvement or deterioration developed by the Ohio Experiment Station and Ohio State University. The results in 1939 of 258 farms in the county are compared with those on 240 farms in 6 adjoining counties where the regional program was used. An appendix shows the productivity factors assigned to each acre or unit of practice in the Licking County program. Data are included regarding the two sets of farms for the years 1935-39, inclusive, and the changes to be made in the 1940 Licking County program.

Forty-two of the farms in Licking County and 83 in the adjoining area did not participate in the programs in 1939. On 127 and 141 farms, respectively, the acreages of corn were within the 1939 acreage allotments, and on 89 and 16 farms, respectively, the allotments were exceeded. Reduction of corn acreage was made on 98 and 96 of the participating farms, respectively, in the two areas. Payments averaged \$63 per farm for the participating farms in Licking County and \$111 on the participating farms in the adjoining areas. The productivity balances in 1937, 1938, and 1939 on the farms in Licking County and in the adjoining counties were: Participating farms within the 1939 corn allotments —0.74, —0.62, and —0.45, and —0.75, —0.58, and —0.49; participating farms with more than the 1939 corn allotment —0.77, —0.67, and —0.67, and —0.50, —0.04, and —0.45; and nonparticipating farms —1.01, —1.08, and —1.19, and —0.78, —0.75, and —0.57. In both areas the percentage of farmers receiving payments increased with size of farm. In general, farms with low yields complied to a lesser extent with the corn allotments than did those with higher appraised yields. From 1938 to 1939 owners and tenants related to owners reduced the acreages of corn and wheat 6.5 but increased other depleting crops 3.2. Tenants not related to owners reduced wheat and corn 4.4 and increased other depleting crops 4.6.

Crop rotations practiced in Tennessee types of farming areas III, XI, and XIV. C. E. ALLRED, B. H. LUTZKE, and B. A. FRANKLIN (*Tennessee Sta., Agr. Econ.*

and *Rural Sociol. Dept. Monog. 116 (1940)*, pp. [1]+11+27, figs. 11).—Based on crop histories for Crockett and Overton Counties, 1932-36, and Roane County, 1935-39, the crop rotations in the three types-of-farming areas are discussed.

Farming possibilities in a problem area of the East Tennessee Valley.—A preliminary report, C. E. ALLED, H. J. BONSER, R. G. MILK, and J. D. RUSH. (Coop. U. S. D. A.). (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 114 (1940)*, pp. [1]+VI+53, figs. 7).—This preliminary report is based on the study of existing farm units comprising 3,581 acres in Roane County plus a few farms in Anderson County. The topography; markets; population; resources; land use; farm organization; investments; receipts, expenses, and income; family incomes and expenses; social contributions and costs; the possibilities of the area; and the possible systems of profitable farming are discussed.

Basic data on [9] Tennessee Counties, R. G. MILK. (Coop. U. S. D. A.). (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monogs 102-A (1940)*, pp. [2]+9; 102-B, pp. [2]+10; 102-C, pp. [2]+9; 102-D, pp. [2]+7; 102-E, pp. [2]+6; 102-F, pp. [2]+8; 102-G, pp. [2]+7; 102-H, pp. [2]+8; 102-I, pp. [2]+6).—Maps, reports, aerial photographs, surveys, and statistical and research data are listed for and relate to Roane, Jefferson, Claiborne, Coffee, Giles, Bledsoe, Henry, Hardin, and Humphreys Counties.

The Northern Great Plains (Washington: Govt., 1940, pp. [2]+44, figs. 4).—The work of the Northern Great Plains Committee, appointed by the Federal Government in 1936, is described. The problems of the area, its rehabilitation through irrigation and dry-land readjustments, and the work of rehabilitation by States and local communities are discussed. The findings and recommendations of the National Resources Planning Board and lists of its publications are included.

Type-of-farming areas in Saskatchewan, R. A. STUTT (*Sch. Agr., 20 (1940)*, No. 9, pp. 526-531, fig. 1).—The objectives of this study were to define the types of farming and determine the boundaries of each area.

Extended functions for institutional landowners, C. L. STEWART (*Jour. Land and Pub. Util. Econ., 16 (1940)*, No. 3, pp. 357-362).—Some basic principles for the control of corporations owning or operating farm real estate and for the relationship between institutional owners and tenants are suggested and discussed.

Capital rationing, uncertainty, and farm-tenancy reform, T. W. SCHULTZ. (Iowa Expt. Sta.). (*Jour. Polit. Econ., 48 (1940)*, No. 3, pp. 309-324).—The purpose of this contribution is to formulate certain basic features inherent in tenancy reform having a direct bearing on the combination of resources of the farm and consequently upon the cost structure in order to point out fundamental economic effects following a change in the system of tenure from tenancy to ownership. Two conclusions regarding farm-tenure reform are: (1) Changing tenants to encumbered owners reduces materially the returns of farmers who have limited assets, and (2) unforeseeable windfalls and losses due to changes in prices, interest rates, and technology make ownership, especially when the property is heavily encumbered, a much greater gamble for the farmer than renting.

Crop insurance—an experiment in farm-income stabilization, J. C. CLENDENIN (*Jour. Land and Pub. Util. Econ., 16 (1940)*, No. 3, pp. 277-285).—This is a description and discussion of the operation of the crop insurance plan for wheat and the present and future problems.

"The wheat crop insurance venture may at this stage be called promising but unproved. Several more experimental years are needed to prove the salability of the insurance and its capacity to bear an expense-money loading

Possibly the project will require some expense-money assistance from the Government indefinitely; if so, we need to discover how much is necessary and whether the social stability obtainable is worth its cost."

Homestead tax exemption in the United States, M. T. OLCOTT (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. List* 15 (1940), pp. 23). Seventy-two selected references, chiefly for the period January 1927 to October 1940, are included, grouped by States and as general.

Agricultural finance in the United States, [1], II, H. W. TORGLESON (*Jour. Land and Pub. Util. Econ.*, 16 (1940), Nos. 2, pp. 196-206, fig. 1; 3, pp. 318-324).—"The purposes of this article are to present a general picture of American agricultural finance today and to discuss certain current problems in the Federal program of agricultural financing."

Preliminary report on local public finance situation in Sheridan County, Montana, S. W. VOELKER. (Coop. U. S. D. A. et al.). (*Montana Sta. [Mimeoq. Cir.* 21] (1940), pp. [3]+56, figs. 2).—The present situation is analyzed, and possible solutions to the tax problem are outlined.

Advantages and disadvantages of Government price control, R. W. BARTLETT. (Univ. Ill.). (*Ind. State Dairy Assoc. Ann. Rpt.*, 50 (1940), pp. 80-88).—This is a discussion of Government price control, with special reference to milk.

Price fixing by government in foreign countries, 1926-39: A selected list of references on direct price fixing of agricultural products by foreign governments, A. M. HANNAY (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Biblog.* 86 (1940), pp. VIII+631).—This is a selected list of over 1,800 references. The general references are arranged alphabetically under the country and the laws for each country, classified by products, and listed chronologically. General treatises on price control and purely theoretical discussions of price fixing and references to the international wheat agreement of 1933² are omitted, and attention is called to a brief article containing the text of the final act of the Conference of Wheat Exporting and Importing Countries³ and an analysis of the difficulties inherent in the application of a controlled international wheat price by Taylor (*El. S. R.*, 74, p. 117). No attempt was made to include price fixing due to the present war in Europe.

Belgian rural cooperation: A study in social adjustment, E. J. ROSS (*Milwaukee, Wis.: Bruce Pub. Co.*, [1940], pp. XIII+194, [fig. 1]).—The object of this book is to analyze the crisis in Belgian agriculture at the end of the last century, to compare present conditions with the conditions then, and to draw conclusions regarding the changes, which are due largely to the adoption of cooperation. Part 1 describes the physical and cultural setting in sections on the physical environment, Belgian agriculture today, and the Belgian people. Part 2 deals with the crisis of the last century. Part 3 discusses the means taken to solve the agricultural difficulties, including action taken by the government, the work of private cooperatives, and the role of the clergy, and shows how the development of the cooperatives represents an adjustment to the basic life patterns of Belgium and the Belgian people and also how the principles of cooperation have been modified by these conditions. Part 4 compares the conditions before and after the development of agricultural cooperatives. A bibliography is included.

The elements of marketing, P. D. CONVERSE and H. W. HURGY (*New York: Prentice-Hall*, 1940, 2. ed., rev., pp. XVIII+823+89+XVI, [figs. 13]).—In this revision (*El. S. R.*, 68, p. 783), more emphasis is placed on marketing economics

² *Jour. Min. Agr. [Gr. Brit.]*, 40 (1933), No. 8, pp. 716-718.

³ See pp. 718-720 of citation in footnote 2.

and policies, important material that has become available is included, and the treatment of the parts dealing with market institutions and marketing of farm products is condensed. Cost and efficiency of marketing, income and its distribution, field warehousing, factoring, increasing and decreasing costs as applied to retailing and wholesaling, relation of volume of sales and location to expenses of retail stores, supermarkets, ABC labeling, classification of goods, Government regulations, etc., are treated more completely. In addition to part 1 dealing with the meaning and cost of market distribution, the consumer, and the development of marketing methods, and part 7 conclusions, the material is presented in parts dealing with functional and commodity approaches, market institutions, commodity marketing, merchandising, and prices and competition.

Transportation of farm products in central Indiana by commercial truckers, C. M. HARDIN and T. K. COWDEN (*Indiana Sta. Bul.* 446 (1940), pp. 34, figs. 7).—This second bulletin in the series (E. S. R., 83, p. 264) is based on interviews with 161 commercial truckers specializing in the transportation of farm products. Analysis is made of the annual expenditures for operation, the effects of miles traveled and age of truck on the costs, the returns to operators per load and per mile, and the rates and returns for livestock, grain, and supplies.

The average 1½-ton truck included in the study was driven 24,112 miles per year at a cost of 42 ct. per mile. The average operator of 1 truck had a labor return of \$917. Operators of 2 or more trucks had an average return of \$1,159 as compared with \$3,657 for semitrailer operators. One-truck operators hauled an average of 409 loads per year. The average trip was 37 miles, the average load 2.7 tons, the average receipts per load \$5, and the average return per hour of labor approximately 40 ct. Receipts per mile averaged 9.1 ct. and cost including labor 8 ct., leaving a profit of 1.1 ct. Approximately 45 percent of the tonnage was livestock, 28 percent grain, hay, and straw, 7 percent coal, 5 percent lime, 3 percent fertilizers, and 12 percent miscellaneous commodities. Receipts for return loads constituted only 4.1 percent of total receipts. Such receipts are an important item in profits since they involve but little additional cost, but recent legislation is discouraging return loads by placing additional restrictions on operators hauling manufactured goods.

Trend of motor transportation rates for livestock in Ohio, G. F. HENNING and E. B. POLING (*Ohio Sta. Bimo. Bul.* 206 (1940), pp. 152, 153).—Included are tables showing the indexes, simple average and weighted average, of trucking rates to Cleveland, Columbus, and Cincinnati by years 1929-39 for hauls of 0-49.9 and 50-99.9 miles for cattle, calves, hogs, and sheep.

Markets and prices for New Hampshire berries, L. A. DOUGHERTY (*New Hampshire Sta. Bul.* 321 (1940), pp. 52, figs. 15).—"This study was undertaken in order to bring together more facts concerning the small fruit industry in New Hampshire. It deals principally with markets, methods of sale, prices, and opportunities for growers of small fruits in New Hampshire. Some data are also included on varieties, yields, and returns. The more complete utilization of local markets and possible outlets for surplus berries, if expansion should occur, are also given consideration." The data were gathered through questionnaires and direct contacts with producers, retail stores, hotels, camps, etc.

An analysis of dealers' sales of milk and cream in the New York market, 1933-38, C. J. BLANFORD. (Coop. U. S. D. A.). ([*New York*] *Cornell Sta. Bul.* 735 (1940), pp. 24, figs. 44).—The fresh milk and fresh cream receipts are analyzed to determine consumers' response to price changes, business conditions, seasons, etc., during a period of business depression and recovery. The

New York City market; grades of milk and types of packages; milk and cream receipts; trends in sales of grade A and grade B milk and heavy cream; seasonal, day-of-the-week, and holiday variations in sales; and the variations due to price changes and business conditions are discussed.

Changes of 1 ct. per quart in the price of grade B milk had only a slight effect on total sales. A 1-ct. change in the price of half pints of heavy cream had only a slight effect on the total sales, but changes of 2 or 3 ct. caused material changes in sales. During the period there was no change of over 1 ct. in the price of milk on retail routes. On two occasions the price at stores declined rather sharply and there was a marked increase in sales at stores, without much change in sales on retail routes. The relationships between milk and cream sales and business activity, as measured by the *New York Times Index* or department-store sales in New York and Brooklyn, were not as close as might be expected. Milk receipts lagged about 10 mo. behind the *New York Times Index* and about 5 mo. behind department-store sales. Cream receipts lagged about 10 mo. behind department-store sales.

Knoxville wholesale fruit and vegetable market.—I, **Buyers and buying problems**, C. E. ALLED, R. H. LUEBKE, and W. S. CRAWFORD (*Tennessee Sta., Agr. Econ. and Rural Sociol. Monog. 115 (1940), pp. IV+34, figs. 9*).—The market agencies for fruits and vegetables in Knoxville, the buying by retailers, the purchases of out-of-town buyers, and the needs of the wholesale and retail buyers in order to meet customers' demands are described.

Cooperative marketing of Ohio potatoes by the Ohio Farm Bureau Cooperative Association, C. W. HAUCK. (Ohio Expt. Sta. et al.). (*Ohio State Univ., Dept. Rural Econ. Minicog. Bul. 132 (1940), pp. [2]+14, pls. 3*).—The data were gathered primarily from 535 potato growers in 21 counties and 38 of the 129 dealers who had purchased potatoes from the association during the years 1934-35 through 1939-40. The grades of potatoes sold, important outlets, and prices received in 100- and 15-lb. bags, 1936-37 through 1939-40, are analyzed. The modified program adopted by the association for 1940-41 is discussed.

Two-thirds of the growers were affiliated with the Farm Bureau, but 56 percent had not sold potatoes at any time through the Bureau. Of the growers, 61.5 percent believed the Farm Bureau marketing program had been beneficial and 7 percent that it had been detrimental. Of growers replying regarding marketing methods, 211 favored pooling and 105 individual sales, 166 preferred that the Bureau take full responsibility to make sales, 160 that the grower take full responsibility, and 35 favored joint responsibility. Of those answering the questions as to marketing practices, 97 percent favored the Farm Bureau handling potatoes for growers not affiliated with it, 78 purchases for storage, 97 purchases to supply the trade if local growers could not supply the demand, and 89 percent purchases from other States to insure a longer business period. With one or two exceptions, the dealers had high regard for the Farm Bureau. Two objections were raised—(1) the use of the "grower's grade" due to lack of definiteness of specifications, and (2) the inability of the association to guarantee a continuous supply of potatoes. Nearly 60 percent of the potatoes sold were U. S. No. 1. Chain stores took 54.4 percent of the potatoes. In 1936-37, 91 percent were sold in 100-lb. bags and 1 percent in 15-lb. bags; in 1939-40 the sales were 50 and 46 percent, respectively. The differential in price received in favor of 15-lb. bags was 30 ct. in 1938-39 and 33 ct. in 1939-40.

Survey of farmers' selling and purchasing cooperatives in Tennessee, 1938.—A preliminary report, C. E. ALLED and B. D. RASKOFF (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog. 113 (1940), pp. [1]+111+28*,

figs. 6).—This preliminary report on a study in cooperation with the T. V. A. describes the development and the reasons for organization and discontinuance in the State of the two types of cooperatives.

Of 922 cooperatives organized since 1874, 102 were active in 1938, of which only 11 were organized prior to 1919. The chief reasons for going out of business reported by 305 associations were inefficient management, inadequate educational program, inability to readjust with change in agricultural conditions, consolidation or reorganization, no economic need for the association, lack of a definite credit policy, improper financing, inadequate accounting records, overinvestment in fixed assets, dishonest management, inclement weather, fire, and disease.

Periodicals issued by farmers' marketing and purchasing associations (*Farm Credit Admin.* [U. S.], *Coop. Res. and Serv. Div., Misc. Rpt. 5, rev. (1940)*, pp. [4]+23).—This is a list of publications issued or sponsored by marketing or purchasing associations, official organs of such associations, and general organizations sponsoring farmers' cooperatives. The publications are grouped by commodities.

Prices of beef cattle, L. ROBERTSON and M. P. MITCHELL (*Indiana Sta. Bul. 445 (1940)*, pp. 22, *figs. 26*).—Charts are included and discussed showing the relationships of beef cattle prices and general price level, general business conditions, beef cattle production and purchasing power cycles, classes and grades, seasonal variation, condition of western ranges, size of corn crop, past margins of profit, and changes in consumer demand.

Farm sales of Ohio milk through different outlets.—I, Columbus area: Delaware, Fairfield, Franklin, Licking, Madison, Pickaway, and Union Counties, C. G. McBRIDE and R. W. SHERMAN (*Ohio State Univ., Dept. Rural Econ. Mineog. Bul. 131 (1940)*, pt. 1, pp. [2]+30, *figs. 11*).—This study is based on a survey of all farms with three or more dairy cattle. The changes in market outlets 1903-40, the status of manufacturing outlets, transportation facilities, sanitary controls by health boards, cooperative marketing, and types of farming are discussed.

Receipts, utilization, and prices of milk and cream in Maine milk control areas, G. F. DOW (*Maine Sta. Bul. 399 (1940)*, pp. [4]+73-183, *figs. 17*).—Federal and State milk control and the Maine milk control areas are described. The receipts and distribution of milk and cream in the State; the seasonal, day-of-the-week, and holiday variations in distribution; the surpluses; and the prices of milk and cream, including allocation of retail prices between producers and distributors, effect of size and location of markets, effects of price changes and business conditions on consumption, etc., are analyzed. An appendix includes the Maine milk control law, rules and regulations of and forms used by the control board, and references on legal aspects of milk control.

What becomes of the consumer's dairy dollar? T. K. COWDEN. (Purdue Univ.). (*Ind. State Dairy Assoc. Ann. Rpt., 50 (1940)*, pp. 69-79, *fig. 1*).—This is mainly a summarization of State and Federal studies as to the percentages of consumer's expenditures for different purposes, different dairy products, and for different items in the costs of producing and distributing dairy products.

Price of coffee in Puerto Rico from 1900 to 1938, J. J. SERBALLÉS, JR. and M. VÉLEZ, JR. (*Puerto Rico Univ. Sta. Bul. 54 (1940)*, pp. [2]+24, *figs. 7; Span. abs., pp. 22-24*).—Data for approximately 30,000 coffee purchase transactions were obtained from 14 exporters, 9 dealers, 2 farmers, and 1 coffee roaster in 12 towns. The area planted to coffee, the production, exports to different countries, and legislation affecting the price of coffee are discussed. Tables and charts are included and discussed showing the monthly average Puerto Rican

farm price of coffee; the monthly variations in periods of stable, increasing, and declining prices; and the relation of farm prices to Puerto Rican production and exports, to world production of mild and all coffee, to prices of Latin-American coffee in the New York City market, and to wholesale commodity prices in the United States and of the purchasing power of coffee to that of other commodities in the United States. A Spanish summary is included.

Crops and Markets, [August–September 1940] (*U. S. Dept. Agr., Crops and Markets*, 17 (1940), Nos. 8, pp. 157–184, figs. 2; 9, pp. 185–208, figs. 4).—Crop and market reports of the usual types are included.

RURAL SOCIOLOGY

[Abstracts of papers on rural sociology] (*Assoc. South. Agr. Workers Proc.*, 41 (1940), pp. 38–40, 44, 45, 73, 74).—Included are the following abstracts of papers presented at the 1940 convention of the Association of Southern Agricultural Workers: Marginality Among Farm People, by W. E. Garnett (pp. 38, 39) (Va. Expt. Sta.); Causes of Marginality in Farm People, by C. E. Allred (pp. 39, 40) (Univ. Tenn.); The Mobility of Farm Population, by O. D. Duncan (pp. 44, 45) (Okla. A. and M. Col.); and Human Relations in the Changing Conditions of Southern Agriculture, by H. Hoffsommer (pp. 73, 74) (La. State Univ.).

Alabama rural communities: A study of Chilton County, I. T. SANDERS and D. ENSMINGER. (Coop. U. S. D. A.). (*Ala. Col. Bul.*, 33 (1940), No. 1A, pp. 80, figs. 26).—This is an analysis of the rural communities of an Alabama county.

The situation and prospects of the population in the Black River settlement, Louisiana, T. L. SMITH and S. E. GRIGSBY (*Louisiana Sta. Bul.* 319 (1940), pp. 42, figs. 4).—Conclusions reached by the authors were: The minute family farms of this settlement of 490 families in a distress area are incapable of producing more than a subsistence livelihood as long as the backwaters of the Mississippi, Red, and Black Rivers are allowed to destroy the crops. The living conditions as reflected by the shabbiness of the houses, the smallness of the homes in comparison to the size of the family, lack of screening, and primitive sanitation, cannot be expected to rise above the simplest standards so long as the inhabitants depend upon the land as their primary means of income. Apparently the families in this area are habitually on, and oftentimes below, the economic margin.

The changing school population and its implications, J. F. THADEN. (Mich. Expt. Sta.). (*Mich. Acad. Sci., Arts, and Letters, Papers*, 25 (1939), pt. 4, pp. 629–640).—The author shows that a rapid change in the character of the school population is taking place—a decrease in the elementary grades and an increase in the secondary school. In Michigan, enrollment in the elementary divisions dropped from 838,790 in 1930 to 691,544 in 1938, a decrease of 17.6 percent.

The population of New Mexico: Its composition and changes, S. JOHANSEN (*New Mexico Sta. Bul.* 273 (1940), pp. 56, pl. 1, figs. 17).—Conclusions reached by the author were: Topographical and climatic features have been important forces in the settlement of New Mexico. Population has grown from slightly over 60,000 in 1850 to 528,687 in 1940. The greatest increase took place between 1900 and 1910. The average number of persons per square mile in 1930 was only 3.5 compared with 41.3 for the United States as a whole, but varied from 0.5 person per square mile in Catron County to 37.4 in Bernalillo County. In 1930, approximately three-fourths of the population resided in rural areas, but the proportion of rural people in the total population declined at each census enumeration between 1880 and 1930. The major part of the population growth

has resulted from increase in the number of persons born in the State. The racial elements of New Mexico are the Anglo-Americans, the Spanish-Americans, and the Indians. The proportion of single males was less in 1930 than in 1880, while the proportion of single females increased slightly. Between 1850 and 1930 the average size of New Mexico families decreased from 4.6 to 4.1 persons. Urban families are the smallest and rural farm families the largest. The illiteracy rate declined rapidly between 1880 and 1930, but in 1930 was 13.3—more than 3 times the rate for the United States. New Mexico had the highest birth rate of all the States in 1936 and a rate nearly twice as high as for the United States. The death rate was exceeded only by that of one other State. New Mexico also had the highest infant mortality rate of all the States, more than twice that of the United States. The Indians constituted nearly 7 percent of the total population of New Mexico in 1930, concentrated in a few counties in the northwestern portion of the State. Few Indians live in urban centers. The illiteracy rate among the Indians is much higher than that for the total New Mexico population.

Selective factors in migration from a New York rural community, A. A. GESSNER. (Coop. U. S. D. A.). ([*New York*] *Cornell Sta. Bul.* 736 (1940), pp. 55, figs. 8).—Supplementing an earlier study by Hoag (*E. S. R.*, 46, p. 386), "this bulletin states the findings regarding migration and the factors associated with it for 339 former students enrolled in Belleville Union Academy between the years 1919 and 1938. Forty-nine percent of them have taken up residence outside the district and another 5 percent are attending school outside the district. Almost one-fifth of the whole group are now city dwellers, and almost 40 percent of the migrants moved to cities. . . . More women than men have left the area, and a larger proportion of the female migrants than of the male migrants went to cities. Fifty-two percent of the migrants and 44 percent of the nonmigrants came from the upper halves of their classes. . . . If the selective process which has affected the migrations of the older members of the group continues to operate in the same way upon the younger members, the selection of migrants on the basis of scholastic ability will eventually be much greater for this group. . . . Twelve percent more of those who have left than of those who remained had training beyond high school. Twenty-four percent more of those now in cities than of those in rural areas had training beyond high school. Seven percent more of the village-reared than of the farm-reared students have left the district. The proportion of village-reared in cities is twice that of farm-reared. Half the men were in agriculture. Three-fourths of the women were in domestic occupations, including homemaking in their own homes. The men who remained in the community remained to follow agricultural pursuits to a large extent. Sixty-eight percent of those who left went into nonagricultural occupations. The occupations of fathers and sons were closely related in the case of the agricultural occupations."

Movement of people from North Dakota farms continues, J. P. GREENLAW and R. NOVAK (*North Dakota Sta. Bimo. Bul.*, 3 (1940), No. 1, pp. 11-14, fig. 1).—The authors show that during 1939 there was a net migration of 3,000 persons away from North Dakota farms, and offer suggestions concerning possible adjustments.

A survey of standards of life of New Zealand dairy-farmers, W. T. DOIG (*New Zeal. Dept. Sci. and Indus. Res. Bul.* 75 (1940), pp. 113, figs. 7).—A description of the standards of life of these dairy farmers and their families.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

The role of the land-grant college in governmental agricultural programs, J. A. VINE ET AL. (*Iowa State Col. Bul.*, 38 (1938), No. 2, pp. 14).—This report

was prepared by a committee of the faculty of Iowa State College as an attempt to clarify Federal-State relationships in agriculture.

Federal-State relationships in agriculture.—II, Education for action programs in agriculture, J. A. VING ET AL. (*Iowa State Col. Bul.*, 38 (1939), No. 28, pp. 15).—This report, prepared by the committee referred to above, is a further study designed as a basis for cooperation between the land-grant college and the National Government.

Some social science courses required by agricultural colleges, 1939, C. E. ALLEED and B. D. RASKOFF (*Tennessee Sta., Agr. Econ. and Rural Sociol. Dept. Monog.* 112 (1940), pp. [1]+11+32).—The number of quarter-hours of social science required for graduation with majors in each of 10 major fields of study in 48 United States colleges of agriculture ranges from none in 2 colleges to 39 in 1 college, 35 colleges requiring 9 hr. or more. Of the required courses, 2 are in general economics, 13 in agricultural economics, 5 in sociology, 4 in history, 4 in political science, 2 in psychology, and 2 in philosophy. Four colleges require from 4 to 9 quarter-hours of social science but permit unrestricted electives. Of the 48 colleges, 35 require 1 or more courses in agricultural economics; 29 require 1 or more courses in general economics; 10, 1 or more in sociology; 6, 1 or more in political science; 5, 1 or more in history; and 2 require courses in psychology and philosophy. Social science requirements by major fields of study are heaviest for majors in agricultural business, agricultural administration, agricultural economics, and agricultural education.

Teaching conservation in elementary schools, E. G. BATHURST (*Fed. Security Agency, U. S. Off. Ed. Bul.* 14 (1938), pp. V+125, pl. 1, figs. 17).—"The purpose of this bulletin is to aid teachers in the selection, adaptation, and organization of materials for the teaching of conservation in grades 1 to 7 or 8." The principles of organization are discussed, with a suggested curriculum plan. Sources of help for teachers are listed, and teacher's preparation, teaching plan, and the daily schedule are discussed. Special emphasis is placed on the curriculum unit and presentation of suggestions appropriate for rural and urban pupils of different ages.

A functioning program of home economics, I. SPAFFORD (*New York: John Wiley & Sons; London: Chapman & Hall*, 1940, pp. XIII+469).—"This book is for the administrator, curriculum worker, or teacher within or without the field of home economics who in rebuilding the curriculum would draw into it the best that each field has to offer." The several chapters deal with the meaning of home economics, the schoolman's attitude, home-life education, building a dynamic program of education, the administrator and the home economics program, and home-life education in elementary, junior high, and senior high schools, for adults at college level, and for professional students in college.

Personnel administration and personnel training: A selected list of references, M. BENTON and H. L. BUCKARDT (*U. S. Dept. Agr., Soil Conserv. Serv. Bibliog.* 2 (1940), pp. [2]+11+59).—Included is a list of bibliographies and over 430 annotated references.

FOODS—HUMAN NUTRITION

[Foods and nutrition studies by the Indiana Station] (*Indiana Sta. Rpt.* 1939, pp. 9, 21, 22, 92, 93).—This report summarizes the progress of work on vitamin A requirements and values and the estimation of carotene; the relation of color and composition to culinary quality of Indiana potatoes grown in muck and other soil types, by G. Redfield; the utilization of pork products,

including studies of the effects of freezing storage on palatability, cooking losses, and tenderness, by R. Jordan and O. D. Collins; continued studies (E. S. R., 81, p. 736) on hydrogenated lard, by Jordan and Collins; and mineral losses in cooking vegetables in salted water.

Making white and whole wheat bread with three types of yeast and hard wheat flour, E. J. THIESSEN (Wyoming Sta. Bul. 242 (1940), pp. 32, figs. 3).—The experimental work reported was concerned with the development of good formulas for home-made bread, the baking of white bread with hard-wheat flour by the long and short process, and the baking of whole-wheat bread, using similar processes and yeasts as for the white bread. Consideration was given to variations in ingredients (including differences in granulation and composition in the case of whole-wheat flours), in methods of mixing, and in fermentation and handling of the dough; and to baking, cooling and storing, and staling of the bread. The fermentation values of yeasts in various forms and for different periods of storage were also studied, with the observations that more consistent results were secured with quick acting, dry granular yeasts than with the dry cakes in which preliminary sponges were made; that both dry and compressed yeast stored in air-tight containers were active over long periods when stored at low temperatures; and that compressed yeast was active over a period of several months if kept frozen. The Wyoming hard-wheat flour was found to yield bread of good quality when fermented and baked under standard conditions; in the case of whole-wheat flours better bread was obtained with the finely granulated product than with the more coarsely granulated flours.

In practical application of the experimental studies formulas are given for white and whole-wheat breads, with directions for handling the dough and baking. Common defects in bread and their causes and the scoring of bread are considered.

The gluten mesh, C. O. SWANSON. (Kans. State Col.). (Northwest. Miller, 201 (1940), No. 1, Sect. 2, pp. 3a, 20a, figs. 4).—Dough properties are discussed in terms of the behavior of dough structure, which is pictured as an intricately woven gluten network, enmeshing starch granules in particular and having a film of moisture adsorbed on protein and starch granules. The behavior of dough in baking is considered from the standpoint of the intrinsic character of the protein material and of the substances which make up its environment; these are the substances naturally present in the flour and the substances that are added in the baking formula.

Research on the utilization of agricultural products in California, W. V. CRUESS. (Univ. Calif.). (Chem. and Indus., 58 (1939), No. 33, pp. 773-778).—This paper was presented as an address before the food group of the Society of Chemical Industry (Great Britain), May 10, 1939.

Studies of the nutrition values in prunes, A. F. MORGAN. (Univ. Calif.). (Calif. Fruit News, 101 (1940), No. 2699, pp. 10, 11).—A brief general statement is given concerning recent and current studies on the nutritive value of prunes.

A study of quality and retail prices of Ohio packed vegetables, C. W. HAUCK (Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 123 (1939), pp. [25], figs. 2).—A total of 65 No. 2 cans each of Ohio-packed corn and tomatoes, representing 43 brands of corn from 23 packers and 35 brands of tomatoes from 25 packers, was purchased on the open market, coded, and submitted to the U. S. Department of Agriculture for quality scoring. Averages of quality and price were then computed for each commodity, packer, city, and type of store; and relationships between quality and price calculated.

The corn ranged from 5.5 to 15 ct. a can, with an average of 8.43 ct., and the tomatoes from 5.5 to 14 ct., with an average of 8.2 ct. Corn averaged 6.52

ct. a can in corporate chain stores and 9.87 ct. in independent stores (including voluntary chains), and tomatoes averaged 6.36 and 9.77 ct., respectively. The quality scores also varied widely, the corn scoring from 61 to 95, with an average of 75.4, and the tomatoes from 43 to 93, with an average of 76.2. The differences in quality were considerable between poorest and best samples packed by certain packers even under the same label. There was no appreciable difference between the average scores of samples bought in chain and in independent stores.

As determined by simple comparisons and by statistical analyses, price alone was wholly unreliable as an index of quality for both corn and tomatoes, although as the prices increased there was a slight tendency for quality also to increase. There was a strong tendency for prices of both commodities to cluster at various traditional levels, with wide variations in quality at each of these levels. Fully informative labeling is recommended as holding promise to sellers and buyers alike.

Palatability and color of potatoes bought on a retail market, R. M. GARSWOLD. (Mich. Expt. Sta.). (*Food Res.*, 5 (1940), No. 3, pp. 281-290).—In the interest of simplifying potato testing for culinary quality and consumer preference, a study was undertaken to determine possible relationships among palatability factors as graded by judges and between these factors and color measured objectively. The potatoes used in judging were "old" potatoes grown in Michigan, Maine, and Idaho and purchased in 10-lb. or 1-pk. lots, 50 from each source, on the retail markets of Detroit between the middle of February and the middle of May 1937. The cooking and sampling methods were essentially those of Wright et al. (E. S. R., 75, p. 565), and the grading chart for scoring a modification of the score card used by these investigators and the meat-judging chart of the National Cooperative Meat Project. The scoring was done by an experienced committee of four or five judges. The cooked samples were iced for determining the color when cold in a Lovibond tintometer.

The subjective scores for mealiness showed highly significant positive correlations with other desirable palatability factors, thus indicating the feasibility of considering mealiness alone in subjective ratings. Correlations between boiled and baked potato scores were highly significant both for mealiness and "general conclusion," indicating that if a potato of the type used in the experiment is of good quality when boiled it is likely to be of good quality when baked. The color data showed significant correlation with the judges' scores for palatability, indicating that a comparatively white potato will probably be scored higher by a judging committee than a darker potato. Palatability increased with price of the samples tested and declined with prolonged storage.

Preserving the dietetic value of frozen foods, E. M. CHASE. (U. S. D. A.). (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 1, pp. 34-38).—The various stages in the process of preparing frozen-pack vegetables and fruits from the selection of strains to the marketing of the frozen product are outlined, with the steps which must be taken to insure preservation of quality.

Why eat frozen pack fruits and vegetables? N. TODHUNTER. (Wash. Expt. Sta.). (*West. Frozen Foods*, 1 (1940), No. 4, pp. 3, 4).—This nontechnical discussion of the importance of fruits and vegetables in the diet contains data from a previously published study of the vitamin C content in peas (E. S. R., 81, p. 318) in illustration of the necessity of research into factors influencing the nutritive value of fruits and vegetables during and subsequent to freezing for the frozen-pack industry.

Practical food inspection, I, II, C. R. A. MARTIN (London: H. K. Lewis & Co., 1940, 2. ed., vols. 1, pp. VII+316, figs. 188; 2, pp. VII+275, figs. 53).—Volume 1

of this work, of which the first edition was published in 1932 (E. S. R., 70, p. 242), deals with meat inspection and volume 2 with fish, poultry, and other foods.

The forty-fourth report on food products and the thirty-second report on drug products, 1939, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul.* 437 (1940), pp. 451-485).—This annual report (E. S. R., 82, p. 274), summarizing the results of examinations of foods and drugs for the calendar year 1939, presents data on the proximate constituents of many samples of cereal breakfast foods (corn, oat, rice, rye, wheat, and miscellaneous), together with notes and occasional data on various other products, including beverages, fats and oils, flavoring extracts, maple sirup, meat products, and milk and milk products. A summary of inspection experience for the past 5 yr. in regard to vitamin D milk indicates that 90 percent of all samples examined fully or substantially met the vitamin D unitage claimed.

Buying beef by grade (*U. S. Dept. Agr., Misc. Pub.* 392 (1940), pp. 8, figs. 7).—The United States official grades of beef, Prime, Choice, Good, Commercial, and Utility, based on characteristics (marbling, texture, grain, and color) considered the best indicators of quality, are described, with brief indications as to the use of the grade stamp and the way to obtain graded beef. Cutler and Canner, the lowest grades, are seldom sold in retail meat shops.

The influence of technic on the composition values of identical diets, J. E. HAWKS, M. M. BRAY, J. M. VOORHEES, B. VELEY, C. CARLSON, and M. DYE. (Mich. Expt. Sta.). (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 5, pp. 416-419).—To determine the factors responsible for variations in the composition of identical diets, analyses were made of 212 diets, divided in three series and weighed under slightly different conditions, dried to constant weight at 60° C. and analyzed for nitrogen and calorie values. Precautions were taken to obtain homogeneous samples of the individual foods used and to minimize moisture losses while weighing out the samples. The analytical values, reported as to range and variability, indicated that the least variations occurred when the diets were weighed at one time from the same sample of food on a fairly accurate torsion balance. The results were only slightly less constant, however, when the samples were weighed at 3-day intervals, using fresh supplies of the perishable foods, when trip balances were used in place of torsion balances, or when the size of the samples saved for analysis was decreased.

A dietary study of the middle-class Chinese and Mohammedans in Sungpan, L. T. CHENG and H. C. KU (*Sci. Soc. China, Biol. Lab. Contrib., Zool. Ser.*, 13 (1939), No. 8, pp. [1]-91-99).—This study represented a 7-day winter survey of 16 Chinese and 28 Mohammedan families in Sungpan in northwestern Szechwan Province. It is concluded that the dietaries were adequate except in vitamin C.

School lunches using farm surpluses, R. S. CARPENTER and F. W. YEATMAN (*U. S. Dept. Agr., Misc. Pub.* 408 (1940), pp. [1]+VI+48).—This publication, prepared primarily for the directors of school-lunch programs where surplus foods made available by the Surplus Marketing Administration are used, presents menu patterns of six types with a number of concrete menu suggestions for each pattern, together with recipes and suggested variations.

The influence of the nitrogen content of the diet on the calorie balances of pre-school children, J. E. HAWKS, J. M. VOORHEES, M. M. BRAY, and M. DYE (Mich. Expt. Sta.). (*Jour. Nutr.*, 19 (1940), No. 1, pp. 77-89, fig. 1).—The data on calorie balances given in this paper, together with those on nitrogen utilization discussed in an earlier report (E. S. R., 79, p. 707), were obtained

in two long-continued balance studies on five preschool children. These children received in the first period a diet containing 3 gm. of protein per kilogram per day and in the second a diet furnishing 4 gm. per kilogram per day. The calorie values of food, urine, and feces for 3-day collection periods were determined by means of the oxycalorimeter. The results, together with the calculated absorption and retention (in terms of total calories and percentage of intake), are reported for each child for the individual collection periods.

A comparison of the average intake values with the average retention values for the separate balance periods showed that small diet fluctuations were reflected in the retention values regardless of the level of protein intake. On the higher protein diet, however, the proportion of the intake calories retained (averaging from 88.0 to 91.4 percent in the several periods) was somewhat less than on the medium protein diet (89.9-92.7 percent of intake calories retained), due apparently to increased nitrogen elimination in feces and urine. This corresponded to an increase from 7.3 to 12.0 percent in the average proportion of the intake calories eliminated. Thus, subtracting 10 percent from the intake values to care for excretory losses does not always give accurate results. Although the change from the 3- to the 4-gm. protein diet reduced the actual number, as well as the percentage, of the intake calories available for body needs, at the same time it also produced greater weight gains in the children. Because of the constancy of the level of calorie utilization over the several balance periods it appeared that preliminary periods were unnecessary before the high protein diet.

Dry skim milk in low cost diets, E. P. HUNT. (U. S. D. A.). (*Child Develpmt.*, 10 (1939), No. 4, pp. 241-268, figs. 4).—This study, undertaken to appraise the dietary effects of dried skim milk supplements in low-cost diets deficient in milk products, was conducted over a period of 141 days, the measurement of nutritional effects being limited to consideration of increments of stature. The sample consisted of 213 preschool Negro boys who ordinarily received no more than 1 cup of fluid milk or its equivalent per day. These children, comparable as to body measurements, age, and family living conditions, were divided on a geographic basis into a control group of 101 children and a demonstration group of 112 children. Children from the control group received the equivalent of from 0 to 360 gm. (median 90 gm.) of dried skim milk per day, while those in the demonstration group received from 310 to 1,220 gm. (median 820 gm.). The children were given physical examinations at the beginning and the end of the study.

Measured-diet records which gave an indication of the frequency of use of various classes of foods were obtained for all children. That these were fairly accurate was checked by comparison with quantitative-diet records obtained for a sample of 11 demonstration and 6 control children, and used to calculate the daily nutritive value of the diets of the two groups. The range and the median intake reported for these two groups with respect to Ca, P, Fe, protein, calories, and vitamins A, B, and G indicated, as was to be expected, superiority of the demonstration diet in all nutrients except iron; this superiority was especially evident when the dried skim milk supplements were sufficient to increase the daily milk supply to the equivalent of 820 gm. or more of fluid skim milk. Growth in stature during this period of approximately 4 mo. was more homogeneous and somewhat greater for the 4-year-old demonstration group than for the corresponding series of the control group.

Obesity in childhood.—I, Physical growth and development of obese children, H. BRUCH (*Amer. Jour. Diseases Children*, 58 (1939), No. 3, pp. 457-484, figs. 14).—A study of 102 obese children from 2 to 13 yr. of age was concerned

with their physical growth and development, weight at birth and early development, growth in stature, and skeletal and sexual maturation. The findings compared with results obtained in studies of normal children indicated that growth in stature of the obese children, although in excess of the average normal, was still in harmony with the height development of children who mature early. The skeletal maturation was normal or advanced. The high weight of the obese child was considered only an exaggeration of a normal trend, since the weight of normal children who mature early is significantly higher than that of children who mature later. The menarche in obese girls occurred early, before 10 yr. in some cases, and more than 50 percent of the boys between 11 and 14 yr. of age showed evidence of approaching or attained puberal development. The intensive growth and early maturation as observed in the obese children was considered due to the growth-promoting effect of abundant nutrition rather than the result of hypothyroidism and hypopituitarism.

Proteins and other nitrogenous constituents of water melon seeds (*Citrullus vulgaris*), P. S. KRISHNAN and T. K. KRISHNASWAMY (*Biochem. Jour.*, 33 (1939), No. 8, pp. 1284-1290).—Watermelon seeds, important as a potent source of urease and of some nutritional importance in regions where they form an article of diet, were examined along conventional lines to ascertain the nature of their protein constituents and of the nonprotein and nonextractable nitrogenous material. The shell-free seeds, containing 5.5 percent moisture, 3.8 ash, 5.5 ether extract, and 5.4 percent nitrogen, were ground and defatted by acetone extraction, the defatted material being exhaustively extracted with water, 10 percent NaCl, and 0.2 percent NaOH in succession. The several extracts and the unextracted nitrogenous material were subjected to further study, the results, showing the nitrogen distribution, being reported in each case.

The nitrogen of watermelon seeds was found to be made up of "glutelin, 9.4 percent (extractable 1.6 percent, not extractable 7.8 percent); globulin, 73.2 percent; water-soluble protein, 6.3 percent; proteoses, 3.5 percent; peptones, 1.1 percent; material precipitable by phosphotungstic acid, 0.1 percent; simpler substances not precipitable by phosphotungstic acid, 1.6 percent." The globulin in crystalline form and the glutelin were isolated in pure form and their most important amino acids determined. Independent determinations of arginine and histidine bore out the accuracy of the values for these amino acids obtained by the nitrogen distribution method. The seeds did not contain canavanine or citrulline, either free or combined, and only traces of free arginine were found.

New creatinine standard for basal metabolism and its clinical application, N. B. TALBOT, J. WORCESTER, and A. STEWART (*Amer. Jour. Diseases Children*, 58 (1939), No. 3, pp. 506-511, fig. 1).—In an extension of previous work (E. S. R., 80, p. 848), data on creatinine excretion were obtained on additional normal subjects, including 14 boys from 5 to 6 yr. of age, 16 boys from 7 to 14, and 22 girls from 6 to 14 yr. of age. Caloric output was also determined. By statistical methods, it was shown that the correlation between creatinine and caloric outputs was as good as that between caloric output and weight. The standard as formulated for boys is expressed by the equation caloric output = $0.657 \text{ creatinine excretion} + 822$, and for girls, caloric output = $0.637 \text{ creatinine excretion} + 739$. It is considered that the creatinine standard is as accurate as the weight standard for normal children and of greater accuracy for those that are abnormal, since the creatinine excretion is related to muscle mass rather than metabolic rate. Application of the standard in a study of children with thyroid disorders showed that the creatinine excretion was independent of the rate of metabolism.

Assessment of the level of nutrition: A method for the estimation of nicotinic acid in urine, L. J. HARRIS and W. D. RAYMOND (*Biochem. Jour.*, **33** (1939), No. 12, pp. 2037-2051, figs. 9).—The method described depends upon the cyanogen-bromide-aromatic amine reaction, but with the use of *p*-aminoacetophenone in place of aniline, as employed by Swaminathan (*E. S. R.*, **80**, p. 131) and Bandier and Hald (*E. S. R.*, **82**, p. 586), and with special features as noted in the following description:

"The urine is heated with NaOH to convert any amide into the acid, and neutralized. The specimen is divided into four portions. One is kept as blank and to the other three are added 0, 20, and 40 μ g. of nicotinic acid. The solutions, which must be protected throughout from the light, are warmed with CNBr, cooled, treated with *p*-aminoacetophenone, allowed to stand, and acidified, and the three color intensities measured in a Pulfrich photometer with S 47 filter, comparing with the blank to which no CNBr has been added. For any given specimen the depth of color varies with the pH, with the concentration of salts, and possibly with other factors, but the three readings always lie on a straight line and by extrapolation to zero the content of nicotinic acid can be accurately determined." Recoveries of nicotinic acid in aqueous solution amounted to 105 and 104 percent and added to urine to 98 percent.

Guinea pigs and dogs on a nicotinic acid-free diet showed progressive decrease in excretion to 0 values with the development of symptoms of deficiency. Rats, although showing increased output of nicotinic acid with increased intake, continued to excrete nicotinic acid on a deficient diet. In tests on three normal adult male subjects the nicotinic acid excretion values ranged from 3.1 to 6.2 mg., but with heavy smoking the output of one subject rose from 5 to 7.3 mg., and with heavy smoking in connection with increased intake of nicotinic acid and marmite to values of 9.8, 12.6, and 10 mg. A patient with diagnosis of anorexia nervosa excreted 2.5 and 2 mg. of nicotinic acid in two tests and one with pellagra 1.8 and 2.9 mg. before and 4.6, 4.8, and 10 mg. during treatment.

The effect of choline on the ability of homocystine to replace methionine in the diet, V. DU VIGNEAUD, J. P. CHANDLER, A. W. MOYER, and D. M. KEPPEL (Cornell Univ.). (*Jour. Biol. Chem.*, **131** (1939), No. 1, pp. 57-76, figs. 5).—In growth studies undertaken to test this theory, rats given methionine alone as a supplement to the cystine-methionine-free diet grew well, others receiving homocystine lost weight or showed no gains, and others receiving both homocystine and choline chloride grew well. In other tests rats receiving cystine alone lost weight and this was not checked by choline chloride. In repetition of the experiment with rats from a different stock the results were corroborated in general but with less uniformity in response. This was traced to the presence of a small amount of choline, 1.4 percent, in ryzamin-B. It was also found that the tikitiki and milk extract used in the experiment noted above in which growth was secured with homocystine contained approximately 1 percent of choline. The amounts of the ryzamin-B and of the tikitiki-milk concentrates used were calculated to supply 0.35 and 3.5 mg., respectively, of choline per rat per day. In further studies in which choline was removed from the ryzamin-B without loss of enough vitamin B₆ for curative effect, the best growth was secured with homocystine and choline in addition to the basal diet at a level of 1.25 percent. Analysis of livers of animals on the basal diet plus methionine, homocystine, or homocystine plus choline chloride showed high fat content on homocystine, but on homocystine plus choline a low content similar to that on methionine. These results indicate that the administration of choline enables the rat to utilize homocystine for growth purposes in lieu of methionine. It may be, therefore, that choline makes possible the *in vivo* methylation of homocystine to methionine.

In the preliminary studies with other related compounds and other methyl derivatives it was found that betaine was similar to choline in permitting growth on a diet with homocystine as the sole sulfur-containing amino acid.

The calcium content of gastric juice, J. B. KIBSNER and J. E. BRYANT (*Amer. Jour. Digest. Diseases*, 6 (1939), No. 10, pp. 704-706, fig. 1).—The calcium content was fairly well correlated with the H-ion concentration of the gastric juice as determined in a series of 70 patients and 5 dogs. The calcium averaged 2.06 mg. percent in 36 patients with gastric juice at a pH between 1.49 and 1.91; 2.12 in 17 cases with a pH range between 2 and 2.94; and 4.54 mg. percent in 12 patients with a pH between 3.05 and 3.38. Fasting gastric juice and that obtained following an Ewald test meal contained more calcium than histamine stimulated secretion. The gastric juice calcium in 1 pregnant dog was considerably higher than in man, while the calcium content of fundic pouch juice in 4 dogs was comparable to that of human gastric juice.

The effect of orange juice on calcium assimilation, C. S. LANFORD (*Jour. Biol. Chem.*, 130 (1939), No. 1, pp. 87-95).—Paired groups of young growing rats were maintained for 60 days on a basal diet of ground whole wheat and whole milk, the experimental group receiving in addition 5 cc. of orange juice per rat per day. Gain in total body calcium (calculated as the difference between the calcium content of the experimental animal and the average for controls analyzed at the beginning of the feeding period) as compared with calculated calcium intake indicated that the proportion of the dietary calcium stored by the animals on the supplemented diet was about 8 percent greater than the proportion stored by the control animals on the basal diet alone. "This improved assimilation of the dietary calcium was noted in every instance, and was of unquestionable significance by the usual statistical criteria."

The red blood cell as a source of the iron and bilirubin of the blood plasma, G. BARKAN and B. S. WALKER (*Jour. Biol. Chem.*, 131 (1939), No. 2, pp. 447-454).—According to Barkan and Schales,⁴ there accompany hemoglobin in the circulating erythrocytes two compounds that are intermediate in the transformation of hemoglobin to bilirubin. These carry the "easily split off" blood iron and consist of globin and pseudoheme, the pseudo compound differing from the true one by an opening of the porphyrin ring, probably at the α -methene bridge. The compound in which iron exists with a valence of 2 is designated as α -pseudohemoglobin and the similar compound with trivalent iron is designated as α -pseudomethemoglobin. By the loss of iron and globin these compounds are converted to bile pigment, the final product being bilirubin.

This concept demands that there be a simultaneous transfer of iron and of bilirubin from the red cells to the plasma. The present paper, designed to study this relationship, reports the results of simultaneous determinations of iron and bilirubin in human blood plasma before and after a period of incubation with its own red cells. Freshly drawn samples of human blood containing an anticoagulant were divided into two portions, the plasma being separated out by centrifuge at once in the one sample and after 6 hr. at 37° C. in the other sample. Iron and bilirubin were determined in the plasma by methods noted. In 30 human blood specimens examined an increase of both iron and bilirubin was noted in 18 cases; in 3 there was an increase of bilirubin only; in 4 of iron only; and in 5 no increase was observed. The values reported in detail for 10 of the cases showing increases in both iron and bilirubin indicate that the two constituents were never strictly equivalent, although of the same order of magnitude. The molar increase of bilirubin was usually less than that of iron, due probably to the formation of intermediates. The rate of transfer

⁴ Hoppe-Seyler's Ztschr. Physiol. Chem., 253 (1938), No. 3-4, pp. 83-104.

to the plasma was variable, and the observed increase was inadequate to account for more than a small fraction of the daily production of bile pigment.

In a series tested for bilirubin only no increase was observed in 5 out of 32 normal blood specimens, while among 30 specimens from clinical cases no increase was detected in 14. It was shown also that increase in the plasma bilirubin occurred only in the presence of red cells. The concept of a specific enzyme for the conversion of hemoglobin to bilirubin was refuted in that the presence of quinine or cyanide (enzyme poisons) did not influence the rate of increase of iron or bilirubin.

Iron and copper versus liver in treatment of hemorrhagic anemia in dogs on milk diets. D. V. FROST, V. R. POTTER, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Nutr.*, 19 (1940), No. 2, pp. 207-211).—Mature litter mate collies subjected to repeated hemorrhages superimposed upon an exclusive milk diet from birth were thus brought to an anemic state such that the low hemoglobin level (6-7 gm. per 100 cc.) was maintained with but slight increase over a subsequent 4-week period without therapy. At the end of this period the dogs received daily for a 4-week period one of the following supplements to the milk diet: 100 gm. of whole dried liver furnishing 100 mg. of iron and 3 mg. of copper; iron and copper salts in amounts to furnish 30 and 3 mg. of the respective elements; 30 mg. of iron alone; or 30 mg. of iron for 4 weeks, followed by this amount of iron plus 3 mg. of copper for an additional 4 weeks. With the first two supplements hemoglobin regeneration was optimal; with the iron alone hemoglobin regeneration was slight (only about one-third that with liver or with iron and copper); when the copper was added to the iron supplement at the end of the 4-week period, hemoglobin regeneration was trebled in the succeeding 4 weeks. Only about 16 percent of the iron was utilized to build hemoglobin when iron alone was fed, but two to three times this amount was so used in the two instances where copper supplemented the iron.

The results support the conclusions that whole milk with iron and copper can successfully meet the demand for blood-forming elements occasioned by severe blood loss; that copper is needed with the iron for hemoglobin regeneration; and that with a whole milk diet hemoglobin regeneration is no more rapid with liver therapy than with the iron and copper treatment.

Further evidence of sex variation in the utilization of iron by anemic rats. L. ORIS and M. C. SMITH. (Univ. Ariz.). (*Science*, 91 (1940), No. 2354, pp. 146, 147).—Six litters of young rats made anemic by a 5-week depletion period on a slightly modified Elvehjem and Kemmerer (E. S. R., 67, p. 90) technic were reduced to hemoglobin levels of 2.9-5.4 gm. per 100 cc. of blood. Six male and six female rats sacrificed at this stage averaged 0.015 mg. of Fe per gram of rat, the values for the female rats being no greater than those of the males. The remaining animals were sacrificed and analyzed after a 6-week period in which they received supplements of FeCl₃ furnishing from 0.05 to 0.30 mg. of Fe daily. Gains in weight and in hemoglobin, and Fe content of the body expressed as average total milligrams per rat and as average milligrams per gram are reported for the males and females separately at the various levels of supplement. For the same Fe intake the female rats always showed a higher amount of Fe per gram of rat, and at the lowest level of Fe fed the females retained more Fe than the males in spite of their smaller size. These results were further checked by comparing results with animals that had made equal weight gains; the female rats made greater hemoglobin gains and showed greater Fe retentions than the male rats, both at the 0.05 and 0.2 mg. level of Fe intake. These results support the previous findings (E. R. S., 78, p. 281) that there is a true difference in the way male and female rats utilize iron, and that it cannot be explained by a difference in the weights of the two sexes.

The influence of certain constituents of the diet upon the absorption of lead from the alimentary tract, S. L. TOMPSETT (*Biochem. Jour.*, 33 (1939), No. 8, pp. 1237-1240).—The effect of high- and low-calcium diets on the absorption of lead was studied in experiments with adult white mice fed the experimental diet with supplements of lead acetate (0.05, 0.10, 0.50, and 1.00 mg. of lead per mouse per day) for a period of 14 days, the lead absorption being finally determined by analysis of the entire animal. The lead content of control and test animals and of the unsupplemented diets (which furnished only 0.002 mg. of lead per mouse per day) was determined by the method previously noted (E. S. R., 84, p. 8). The data, reported as total absorption and as absorption per 100 gm. of body weight at the several intake levels of lead, indicate that the absorption of lead was low with the high-calcium diet but high upon the low-calcium diet. In the latter case the absorption increased with increases in the amount of added lead. Although large amounts of lead were absorbed on the low-calcium diet, there was considerable variation between animals receiving the same amounts of lead.

The addition of olive oil (1 cc. per mouse per day) or of cod-liver oil (3 drops per mouse per day) to the low-calcium diets had no effect on the lead absorption. Apparently there was no specific action of the vitamin D and no influence of the fat through the formation of insoluble, hence nonabsorbable, lead soaps in the intestinal tract.

Studies in lead mobilization, S. L. TOMPSETT and J. N. M. CHALMERS (*Brit. Jour. Expt. Pathol.*, 20 (1939), No. 5, pp. 408-417, figs. 10).—Ten cases involving either clinical plumbism or increased lead absorption were studied with reference to the effects of high- and low-calcium diets on the level of blood lead. The high-calcium diets furnishing 2.7 mg. of calcium per day (and sometimes supplemented with intramuscular injections of calcium gluconate) produced a fall in blood lead, whereas the low-calcium diets furnishing 0.13 gm. of calcium per day produced a rise in blood lead either with or without the simultaneous administration of NH_4Cl . The excretion of lead in the two cases studied did not parallel the increase in blood lead. It is considered, therefore, that the deleading process should be undertaken only with adequate laboratory control, since the process may result in a shift of lead to the soft tissues and blood without compensatory increase in excretion. This shift of lead to the soft tissues upon a low-calcium diet was demonstrated in mice given low- and then high-calcium diets following experimentally induced plumbism. Analyses of the skeleton and soft tissues of animals sacrificed at intervals in the experiment showed about 60 percent of the lead to be in the soft tissues, with 40 percent in the skeleton after the period on the low-calcium diet; after the period on the high-calcium diet about 78 percent of the lead was found in the skeleton and 22 percent in the soft tissues. A shift to a second period of low-calcium intake effected a decrease in skeletal lead, accompanied by an increase of the element in the soft tissues. Analytical data are also presented on the lead content of various bones and organs of the one patient who succumbed to lead poisoning.

Oxalic acid in foods and its behavior and fate in the diet, H. F. KOHMAN (*Jour. Nutr.*, 18 (1939), No. 3, pp. 233-246, figs. 3).—Total solids, oxalic acid (anhydrous), and calcium as percentage of fresh substance are reported for a large number of fruits and vegetables. The procedure employed for insuring solution of the total oxalate content and the method of determination (precipitation as CaC_2O_4) are outlined. Almost all of the samples analyzed contained at least traces of oxalate, but only a few foods, namely, spinach, Swiss chard, New Zealand spinach, beet tops, lambsquarters, poke, purslane, and rhubarb, had a high oxalate content (about 10 percent on a dry basis). Of the 53

samples of spinach, including most commercial and many experimental varieties grown in various sections, none was free of oxalate. The samples averaged on a dry basis 9.02 percent (maximum 12.6 and minimum 4.5 percent) anhydrous oxalic acid. Calcium in these same samples and on the same basis averaged 1.25 percent (maximum 2.50 and minimum 0.44 percent). California-grown spinach was found to average lower in calcium than Maryland-grown spinach.

To compare the availability of calcium from greens of high and low oxalate content, feeding experiments were conducted with young rats. The greens at levels to supply about 60 percent of the total dietary calcium were added to a basal diet relatively low in calcium but permitting good though not maximum growth and bone formation. Spinach was used as the green high in oxalate, and turnip greens, mustard greens, kale, and collards as greens with negligible oxalate content. On the diet supplemented with spinach, reproduction was impossible, the bones were extremely low in calcium, tooth structure was disorganized, and the dentin poorly calcified. With the other greens excellent animals were produced and their bodies per unit of weight contained four times as much calcium as the bodies of the rats receiving spinach. Apparently, therefore, the spinach not only supplied no available calcium, but also rendered unavailable much of the calcium from other foods. Considerable of the oxalate from the spinach appeared in the urine (with a tendency to carry calcium with it), but much more appeared in the feces.

The antineuritic value of parboiled rice: A comparison with unmilled raw rice, I. A. SIMPSON (*Inst. Med. Res., Fed. Malay States, Bul. 4 (1939), pp. [1]+15, figs. 6*).—The parboiled rice was prepared by soaking unhusked rice, heating it with water on a slow fire until the grains burst, drawing off the water, and drying in the sun. This dry rice, from which the husks may be readily removed by winnowing, is then milled.

In feeding tests with rats the parboiled rice, whether overmilled or undermilled, compared favorably in antineuritic value with samples of undermilled raw rice. These results suggest (1) the possible retention of pericarp by the endosperm after milling, due to increased toughness of these layers, or (2) the absorption by the starchy kernel of vitamin B₁ soaked out from the pericarp.

Some factors producing individual differences in dark adaptation, L. R. PHILLIPS (*Roy. Soc. [London], Proc., Ser. B, 127 (1939), No. 848, pp. 405-424, figs. 3*).—The factors studied were the diameter of the pupil, coloring, visual acuity, and age. The first three were studied in a group of male medical students, all aged approximately 20 yr. and 8 mo., who had received regular doses of vitamin A totaling 100,000 units during the 6 days previous to the examination. The effect of age was studied on 26 subjects of both sexes whose ages ranged from 17 to 70 yr., with an average of 30 yr. and 6 mo., selected as being on a diet furnishing sufficient vitamin A. The dark adaptation tests were made by the apparatus developed by Lythgoe and Phillips,⁵ and the pupils were photographed for diameter measurements on infrared plates by an infrared flash after 2 min. of light adaptation and at the completion of dark adaptation.

From data secured from 40 subjects in the first group, the various factors were correlated in turn with the times taken from the onset of darkness to see each of the selected brightnesses of the test patch, designated as perception times. Significant correlations were obtained for pupil diameter in the light with perception time for 15 out of 17 test patch brightnesses, and confirmed by the significance of the regression of time on pupil diameter in the light for the whole of the data, indicating that a comparatively large pupil in the light produces a retardation in dark adaptation. The correlation of pupil diameter

⁵ Jour. Physiol., 91 (1938), No. 4, pp. 427-436, figs. 2.

in the dark with perception times for 6 selected test patch brightnesses was not significant. This was attributed to the existence of a significant correlation between pupil diameter in the light and in the dark. When the data were corrected for differences of pupil diameter in the light, a series of negative correlation coefficients was obtained which increased with the duration of dark adaptation, showing that a comparatively large pupil diameter in the dark tends to decrease perception times.

Correlations were insignificant for general coloring and visual acuity (within the limits tested) with original or corrected perception times. A significant negative correlation was obtained for pupil diameter in the light, with age. The mean pupil diameter in the dark, 6.86 mm., was significantly lower than the mean of the group (7.44 mm.). "Some part of the retardation of dark adaptation with age is, therefore, due to a small pupil diameter in the dark. The remainder must be assumed to be due to changes in the retina with increasing age."

Experimental vitamin A deficiency in man and the value of "adaptometry" [trans. title], W. v. DRIGALSKI (*Ztschr. Vitaminforsch.*, 9 (1939), No. 4, pp. 325-330; *Fr., Eng. abs.*, p. 330).—Visual adaptation tests, using the Birch-Hirschfeld photometer, were conducted on a normal healthy adult man who subjected himself over a 72-day period to a diet deficient in vitamin A. The tests were carried out according to the original procedure described for this instrument, with readings at 5- and 10-min. intervals after exposure to bright light. At the beginning of the study readings were taken every third day, later every second day, and at the last as often as three times a day. The results led to the conclusion that "subnormal dark adaptation does not necessarily indicate vitamin A deficiency, but normal dark adaptation is only found when vitamin A is adequately provided."

The vitamin A requirement of man, I, II [trans. title] (*Klin. Wchnschr.*, 18 (1939), Nos. 38, pp. 1269, 1270; 40, pp. 1318, 1319).—Two papers.

I. *The healthy adult*, W. v. Drigalski.—This study, conducted by the method outlined above on a healthy adult subjected to vitamin A deficiency, indicated that the optimal vitamin A requirement of this subject was about 5.9 mg. (9,800 International Units) daily. There was a wide zone between faint hypovitaminosis and severe deficiency, due to the body's great capacity for vitamin A storage. The vitamin A stores lasted several months, although slight deficiency became evident very early.

II. *Pregnant and nursing women and diseased subjects*, W. v. Drigalski and H. Kunz.—In this study, conducted on a number of subjects receiving controlled institution diets of known vitamin A content, the daily vitamin A requirements, expressed as milligrams of β -carotene, were found to be 7, 11, and 20 in 3 women in late pregnancy; 5, 10, and 7 in 3 nursing women; and 4, 5, and 6 in 3 subjects with cirrhosis of the liver.

Vitamin A and carotenoids in the liver of mammals, birds, reptiles, and man, with particular regard to the intensity of the ultraviolet absorption and the Carr-Price reaction of vitamin A, H. B. JENSEN and T. K. WIRB (*Biochem. Jour.*, 53 (1939), No. 11, pp. 1771-1786).—Determinations were made of the amounts of vitamin A and carotenoids in the liver in 8 human subjects and in 33 different mammals belonging to 21 species, 41 birds belonging to 36 species, and 4 reptiles of 2 species. The variations between species were considerable, and there was no simple proportionality between the amount of vitamin A and carotene in the food ingested and the concentration in the liver. The majority of the livers contained no carotene, although it was present in considerable amount in the liver of certain beasts of prey and birds, as well as in the Herbivora. In no instance was vitamin A₂ demonstrated.

Apart from the interest in the vitamin A content of the various livers, the study was particularly concerned with the relation between the extinction coefficients of the Carr-Price reaction and the ultraviolet absorption, since this relationship must be established for each source of vitamin A if the Carr-Price results are to be expressed in International Units. Most of the livers, therefore, were subjected to a detailed spectrographic analysis in the ultraviolet range, a detailed determination of the absorption of the Carr-Price reaction for three different spectral filters, and an estimation of the carotenoids, including microchromatography. The techniques employed are described in detail, and the results are tabulated to show the extinction coefficient $B_{1\text{cm}}^{1\%}$ (1 gm. liver in 100 cc.; 1 cm. layer thickness) of vitamin A at 328 $m\mu$, the Carr-Price reaction with filters S 59, S 61, and S 66.6 in the Pulfrich photometer, and certain ratios of the extinction values. The absorption curves are described briefly.

For livers showing a typical absorption curve, it was found that the relation between the extinction of the Carr-Price reaction with filter S 61 and vitamin A absorption at 328 $m\mu$ had a fairly constant value of 2.60-2.75, with a coefficient of variation of 10-15 percent. The conversion of the extinctions measured with S 61 in the Carr-Price reaction into I. U. per gram of liver is calculated, therefore, from the formula $B_{1\text{cm}}^{1\%} \text{ S 61} = 2.60-2.75$, corresponding to about 1,600 I. U. per gram (or if the amount of vitamin A is expressed in micrograms by the formula $B_{1\text{cm}}^{1\%} = 4,100-4,400$ for the Carr-Price reaction of the pure vitamin A with S 61).

Biological standardization of vitamin-A. P. TAINSH and H. WILKINSON (*Chem. and Indus.*, 58 (1939), No. 48, pp. 1051, 1052).—This preliminary note indicates that the accuracy of the biological assay of vitamin A may be influenced by the nature of the basic diet. It is pointed out that with the diet (slightly modified to introduce 5 percent of agar agar) given in the British Pharmacopoeia, 1932, Addendum, 1936, young rats supplied with 40 International Units of β -carotene (following depletion of the vitamin A reserves of the liver) excrete a carotenoid in the feces; that this is not excreted if 40 I. U. of vitamin A are supplied in place of the β -carotene; that the carotene-fed animals have larger liver reserves of vitamin A than the vitamin A-fed rats; and that the growth responses are smaller on the β -carotene than on the vitamin A supplement. Using the diet described by Morgan (*El. S. R.*, 73, p. 721), however, the carotenoid excretion is not observed, nor is there a difference in vitamin A liver stores or growth rates between rats receiving supplements of vitamin A and those receiving β -carotene. Inclusion of coconut cake meal in the Pharmacopoeia diet gives results comparable with those on the Morgan diet. The differences in physiological response result in marked differences in apparent potency of a given vitamin A preparation assayed against the international standard β -carotene, the relative potencies varying between ratios of 1:1 for the Morgan diet to 2 or more: 1 for the modified Pharmacopoeia diet.

The vitamin A content of "light white" casein. M. K. MAITRA and T. MOORE (*Biochem. Jour.*, 33 (1939), No. 10, pp. 1648-1651).—Light white casein (sodium caseinate) extracted with cold ether or ethyl dichloride yielded about 0.4 percent of fat; subsequent extraction with hot alcohol gave an additional yield of about 1 percent, while direct extraction with hot alcohol alone gave a yield of about 2 percent. Colorimetric estimations on the unsaponifiable portion of these extracts indicated the presence of carotene and vitamin A in the alcoholic extracts. Assuming all the yellow of the alcohol extract to be carotene, the vitamin A of the fat was estimated at about 50 International Units per gram; taking the fat content at the round figure of 2 percent, the value of 1 I. U. per gram was ob-

tained as the approximate total vitamin A activity of the casein. This value was borne out by biological tests in which the light white casein was found to contain enough vitamin A to promote slow growth in rats depleted of the vitamin when included in the diet at the level of 20 percent.

The vitamin A content of cheese, A. W. DAVIES and T. MOORE (*Biochem. Jour.*, 33 (1939), No. 10, pp. 1645-1647).—A sample of English Cheddar cheese was found by biological tests to have a potency of approximately 7.5 International Units per gram, as was to be expected from the milk fat content (about 33 percent). This value corresponded very well with the total vitamin A activity (6-9 I. U. per gram) calculated from the values obtained by colorimetric estimation of vitamin A and carotene content. Colorimetric determinations on other full-milk cheeses, namely, Camembert, Cheshire, Empire red, Empire white, Gruyère, and Stilton, gave similar results. Lower values were found for cheeses of lower fat content, such as Dutch Edam and Danish blue.

Vitamin B₁ content of eight varieties of beans grown in two localities in Michigan, E. KELLY, K. S. DIETRICH, and T. POSTER. (*Mich. Expt. Sta.*). (*Food Res.*, 5 (1940), No. 3, pp. 253-262, figs. 2).—Eight varieties of beans (*Phaseolus vulgaris*) grown in two localities in Michigan in 1936 (with one exception) were tested during the spring of 1937 and the spring and summer of 1938 for their vitamin B₁ content in the dried ground state by the Chase-Sherman rat-growth method with controls on three levels of vitamin B₁, as both the clay adsorbate and crystalline thiamin hydrochloride, for construction of curves of response for interpretation of the growth data on three levels of the beans. The values obtained were not identical for the two curves of response, but were of the same order of magnitude and showed the same differences between varieties and communities. Blue Pod and Robust varieties ranked highest and Kidney, Yellow Eye, and Cranberry varieties lowest, with the Great Northern, Michelite, and a variety designated as 1200-1 of medium value. The extreme range, as determined from the curve of response to thiamin hydrochloride, was from 2.9 International Units per gram (Blue Pod) to 1.0 I. U. per gram (Yellow Eye). It is noted that even the varieties with the lowest value are comparable with whole wheat, certain nuts, and egg yolk in vitamin B₁ content. No significant differences in values for the same variety grown in the two localities were obtained, although a number of varieties were slightly higher in the Fowlerville area (light to medium sandy loam) than in the Romeo district (heavy sandy loam).

Observations on the liver filtrate factor of the vitamin B₂ complex, T. F. MACRAE, A. R. TODD, B. LYTHER, C. E. WORK, H. G. HIND, and M. M. EL SADR (*Biochem Jour.*, 33 (1939), No. 10, pp. 1681-1687).—The portion of an aqueous extract of liver extractable by phenol and not adsorbed on small amounts of charcoal (and containing about one-third of the amount of the filtrate factor present in whole liver extract) served as the source of the liver filtrate factor. From this there was prepared a concentrate representing the deproteinized amyl alcohol extract of a fuller's earth eluate. The concentrate as such, or purified by further adsorption and elution using fuller's earth, was used in the various tests. The rat-growth method previously described by Edgar et al. (*E. S. R.*, 82, p. 297) was used, with slight modification, for determining filtrate factor activity. The following results of the various tests are quoted from the author's summary:

"Liver filtrate factor is not precipitated by salts of lead, mercury, silver, quinine, or brucine, but is precipitated from alcoholic solution by barium hydroxide. The factor is not adsorbed even on exhaustive treatment with fuller's earth; it is, however, adsorbed by large amounts of norite charcoal.

Amyl alcohol and ether extract the factor from acidified solutions. By combination of several methods of concentration a material has been obtained containing the rat day dose of the vitamin associated with about 180 μ g. of dry matter. On acetylation liver filtrate factor yields a product easily extractable from aqueous solution by chloroform and possessing only feeble activity; mild hydrolysis of this material gives a product having biological activity comparable with that of the starting material. Treatment of a liver filtrate factor concentrate with diazomethane does not appreciably affect the biological activity."

Maintenance nutrition in the pigeon: Further evidence for the presence of dietary essentials in yeast and liver and their relation to vitamin B₆, C. W. CARTER and J. R. O'BRIEN (*Biochem. Jour.*, 33 (1939), No. 11, pp. 1810-1815).—Evidence is presented to show that the pigeon requires in addition to aneurin and riboflavin a fuller's earth eluate and a fuller's earth filtrate factor, both of which are present in yeast and liver and may be prepared by the methods described. The eluate fraction was found to have marked weight-restorative action, the effect being maximum when supplemented by the filtrate fraction. Crystalline vitamin B₆ (in daily doses of 40 μ g.), although less active than the eluate fraction, served in place of it to supplement the weight-restorative action of the filtrate fraction. This supplementary relationship with the filtrate fraction was not exhibited by aneurin or riboflavin.

The filtrate growth factor B₇ [trans. title], H. KRINGSTAD and G. LUNDE (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 261 (1939), No. 3, pp. 110-124, figs. 7).—In investigations concerning the vitamin B complex, sugar was the carbohydrate of preference in the basic diet since starches appeared not to be completely free of the B factors. For the basic diet in vitamin B₆ investigations, casein purified by repeated precipitation and washing was found preferable, but for studies on the other B factors fish protein was used, since it appeared to carry sufficient vitamin B₆. Fuller's earth adsorption did not give a sharp separation of the B factors in yeast, since the B₆ was not quantitatively removed from faintly acid (pH=5-6) solutions, while from more acid solutions (pH=1) other factors were also adsorbed and compounds toxic to the rats (weakened by avitaminosis) were also found. Vitamin B₆ was quantitatively precipitated with phosphotungstic acid but not by mercuric acetate. The latter reagent failed also to precipitate the filtrate growth factor B₇. Since this factor (at pH=1) could not be extracted with ether, it is apparently not identical with the chick antidermatitis factor. It is considered that the B complex apart from the known factors B₁, B₂, B₆, and nicotinic acid must contain the following: The chick antidermatitis factor (factor 2 of Jukes), the filtrate growth factor (B₇) of Kringstad et al., which is probably identical with the factor W of Elvehjem et al., the antigrey hair factor (B₈ of Lunde and Kringstad), and possibly other factors.

The newer knowledge of vitamin C in health and disease, E. N. TODD HUNTER, (Wash. State Col.). (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 1, pp. 1-11).—Recent developments in vitamin C research of particular interest to the dietitian are reviewed.

A note on the vitamin C content of some dried, sugared, and salted Chinese vegetables and fruits, L. T. CHENG and H. TAO (*Sci. Soc. China, Biol. Lab. Contrib., Zool. Ser.*, 13 (1939), No. 7, pp. [1]+87-90).—Vitamin C, determined by a modification of the iodometric titration method of Szent-Györgyi and checked by the 2,6-dichlorophenolindophenol method, is reported in milligrams per gram for 27 dried, salted, or sugared fruits and vegetables obtained from Chinese markets. Comparative analyses of a number of fruits and vegetables in the fresh state are also presented. The data indicate that the

vitamin C was completely destroyed in many of the preserved products. Only traces remained in most of the others, the highest value, 0.176 mg. per gram, being that for salted turnip.

The vitamin C (ascorbic acid) content of ten varieties of watermelons, R. E. CLEGG and G. H. SATTERFIELD. (Univ. N. C.). (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 1, pp. 39-42).—The watermelons tested were purchased on the Raleigh, N. C., market as ripe or nearly ripe specimens and were analyzed within 2 days after purchase, using 15-gm. samples cut from the center and the red edible portion $\frac{1}{2}$ in. under the rind. The Lyman, Schultze, and King modification (E. S. R., 78, p. 7) of the Bessey and King titration procedure was used. Values are reported as high, low, and average for each variety.

The portions next to the rind were much more uniform in ascorbic acid content than the heart portions, the averages ranging from 5.31 mg. percent for Cannon Ball to 6.49 mg. percent for Stone Mountain. The averages for the heart sections ranged from 6.37 mg. for the Tom Watson (S. C.) to 10.04 mg. percent for Stone Mountain. The extreme range in values for the heart portion of a single variety was from 7.28 to 13.70 mg. percent for Georgia Rattlesnake. No consistent relationship was evident between the size and shape of the melon and its ascorbic acid content. Samples of flesh and juice from preserved and pickled melon rind gave low values, the highest being 1.31 mg. percent for the juice of pickled rind.

Ultraviolet irradiation and vitamin C metabolism, C. W. JUNGBLUT and R. R. FEINER (*Jour. Lab. and Clin. Med.*, 25 (1939), No. 3, pp. 263-269).—Prolonged ultraviolet irradiation (mercury-vapor lamp) of albino guinea pigs, rabbits, and rhesus monkeys failed to produce any evidence of erythema on the skin; nor was the vitamin C content of the brain, liver, spleen, and adrenal gland decreased by this treatment, as judged by comparison of the analytical values with those determined on control animals receiving no irradiation. The production of a superficial burn on the skin of guinea pigs by the local application of heat was followed, however, by a drop in the vitamin C content of these tissues. From these results and findings cited from the literature, it is concluded that excessive doses of radiant energy apparently cause a derangement of vitamin C metabolism only to the extent that they are capable of producing injury to the tissues.

Investigations into the excretion, absorption, and storage of ascorbic acid in guinea pigs [trans. title], O. J. BROOK (*Ztschr. Vitaminforsch.*, 9 (1939), No. 4, pp. 309-325, fig. 1; *Fr., Eng. abs.*, p. 324).—Guinea pigs weighing 200-400 gm. were used for this study, the animals having been maintained on a basal diet supplied with orange juice until the time of the experimental period. Following the various experimental periods, the ascorbic acid content of the organs (adrenals, spleen, liver, and upper small intestines) was determined by dichlorophenolindophenol titration of a 1.5-percent trichloroacetic acid extract of the tissue. The scorbutic state of the animal was judged from the histological appearance of a stained section of the fixed decalcified root of the incisor, the degree of scurvy being judged according to the scheme of Key and Elphick (E. S. R., 67, p. 189).

In one experiment in which ascorbic acid in doses of 2, 4, 5, or 10 mg. per day was administered orally for 6-17 days, the ascorbic acid content of the adrenals, spleen, and intestine appeared to vary with the intake. With increasing doses even up to 100 mg. daily, the amount stored in these organs scarcely increased above the upper limiting values on the lower doses.

In another experiment the animals were placed on a scorbutic diet after a 7-day saturation period in which 10 mg. of the pure vitamin was administered

daily. It was found that the body stores were depleted at first rapidly, then more slowly, and by the eighth or tenth day the teeth showed the first definite signs of scurvy. At this stage the adrenals contained 0.12-0.15 mg. of ascorbic acid per gram.

The reducing power of the urine, as determined by the dichlorophenolindophenol titration method, was negligibly affected by the oral intake of very large doses (50, 100, or even 1,000 mg.) of ascorbic acid, but injection was followed by measurable excretion of the vitamin. This observation was confirmed biologically by administration of the urine of these test animals to scorbutic guinea pigs.

With small doses of ascorbic acid (2 mg. daily for 14 days), the amount stored in the organs was found to be the same regardless of whether the dose was administered orally or by peritoneal or subcutaneous injection. On the other hand, a single large dose (100 mg.) administered after 12 days on a scorbutic diet resulted in marked storage in the organs if the dose was administered subcutaneously but in only slight storage if given orally.

Changes in the acidity of the gastrointestinal tract as effected by sodium bicarbonate (0.2 gm. in water daily for 14 days) appeared not to interfere with the absorption of small doses (5 mg.) of ascorbic acid. Nor was the absorption disturbed by changes in motility as effected by castor oil (1 cc. for 14 days).

Animals infected with tuberculosis showed no increased usage of ascorbic acid during the incubation period, but usage increased with the development and severity of the clinical symptoms. Hunger induced in test animals by a 5-day period without food was found to have no effect on the storage by the organs of ascorbic acid subsequently administered orally in a 5-mg. dose.

Creatine metabolism in muscular dystrophy due to vitamin E deficiency and its treatment with tocopherol [trans. title], F. VEMZÁR (*Ztschr. Vitaminforsch.*, 9 (1939), No. 3, pp. 242-251; *Fr., Eng. abs.*, p. 250).—In these experiments, presented in some detail, a control group of four adult rats on an ordinary mixed diet and an experimental group of three animals on a vitamin E-deficient diet were observed as to physical signs and the urinary excretion of creatine and creatinine. The rats deprived of vitamin E for several months developed muscular dystrophy and also a marked creatinuria. At this stage administration of large doses (100 mg. daily) of *dl-α*-tocopherol quickly effected a return to normal, the creatinine excretion falling in 1 day from the daily total of 1.4-2.2 mg. to the normal excretion of about 0.5 mg. per day. In vitamin E-deficient animals with muscular dystrophy the creatine : creatinine ratio varied from 10 to 130 percent; upon tocopherol treatment this ratio was promptly reduced to the normal level of about 5 percent.

The curative factor (vitamin H) for egg white injury, with particular reference to its presence in different foodstuffs and in yeast, P. GYÖRÜY (*Jour. Biol. Chem.*, 131 (1939), No. 2, pp. 733-744, fig. 1).—Egg white injury evidenced by the appearance in 5-7 weeks of specific dermatitis of a seborrheic desquamative type was consistently produced in albino rats on a diet composed of 300 gm. of commercial Chinese egg white, 370 gm. of cornstarch, 150 cc. of peanut oil, 50 gm. of salt mixture (McCollum 185), 30 cc. of cod-liver oil, and 100 cc. of an alcoholic extract of yeast prepared by the method of Sherman and Sandels (*E. S. R.*, 66, p. 92). This diet was used in all but a series of earlier experiments in which a similar diet was found to produce consistent reactions in 1,343 rats (792 males and 551 females), only 60 of the group being refractive. As judged by the rate of onset of symptoms in the 1,283 responsive animals, male rats were more susceptible to injury than the females, and suscep-

tibility for all animals decreased progressively with increase in initial experimental weight. A change in the nature of the commercial (German) yeast extract necessitated for subsequent work the modification of the diet used for these earlier studies.

The distribution in foodstuffs of the factor protective against egg white injury and previously designated as vitamin H (E. S. R., 78, p. 895) was studied by the rat curative method. A "rat day dose" was used as the basis of comparison, and the unit was defined as the daily dose of the food or concentrate which in 4 weeks effects complete cure of the egg white injury. Liver, kidney, yeast, and to a lesser extent cow's milk were found to be the main sources of vitamin H. In experiments with rats water extracts of yeast or extracts prepared with fat solvents were not curative of the dermatitis, indicating the insolubility of the vitamin in water or fat. Autolysis of yeasts at 87° C. in the presence of water and toluene yielded autolysates which, in terms of yeast, did not differ materially from the original titer values. The presence of chloroform (an enzyme poison) in contrast to toluene was detrimental to the autolytic liberation of vitamin H from yeast. These results suggest that vitamin H is part of a compound of higher molecular weight insoluble in water or fat and that the vitamin can be liberated from the compound by autolysis; yeast appears to possess the ferment necessary for this liberation.

Attempts to isolate the factor (vitamin H) curative of egg white injury, P. GYÖNGY, R. KUHN, and E. LEDERER (*Jour. Biol. Chem.*, 131 (1939), No. 2, pp. 745-759).—Fresh liver or a liver powder representing the dry residue remaining after removal of liver extract was used as the source of vitamin H in these isolation experiments. Fresh liver, unlike yeast, did not yield vitamin H upon autolysis, but proteolytic digestion of liver with pepsin or papain but not with trypsin served to liberate the vitamin. With fresh liver papain was not as effective as pepsin, but with liver powder satisfactory results were obtained with papain digestion, particularly after preliminary autolysis of the powder and discard of inactive break-down products with the filtrate. Hydrolysis of fresh liver or kidney under normal or high pressure did not liberate the vitamin, but in the presence of acid (H_2SO_4 or HCl) liberation was effected under high pressure. Liver powder, when autoclaved with or without acid for 1 or 2 hr. at about 200° C. gave very good yields of the vitamin. Further concentration from the hydrolysates was accomplished by extraction with acetone, methanol, or ethyl alcohol.

Vitamin H was precipitated quantitatively from crude concentrates by phosphotungstic acid, although large amounts of the acid were needed. Preliminary concentration of the vitamin by adsorption on charcoal and elution with a mixture of water, pyridine, and methanol, followed by hydrolysis of the eluate with 4 percent H_2SO_4 , gave a solution from which precipitation with phosphotungstic acid was more effective. This precipitate was decomposed with barium hydroxide. Gold chloride successfully precipitated the vitamin from eluates, particularly after preliminary precipitation with phosphotungstic acid. The gold was removed with H_2SO_4 rather than H_2S , since various sulfides (Au, Cu, Pt, but not Pb) adsorbed the vitamin. A large number of miscellaneous precipitants also tested gave negative results. In various preparations obtained by precipitation following adsorption and elution, the concentration of the vitamin was such that one rat day dose contained 0.5 mg. of organic dry residue, corresponding to 75-100 mg. of the original liver powder. Further chemical purification of these concentrates lowered the rat day dose in special experiments to from 30% to 40% of organic dry residue. Water solutions of these preparations were inactivated by treatment with formaldehyde, nitrous acid, benzoyl chloride, and ketene.

Papain digestion or hydrolysis under pressure were successfully applied to yeast autolysates, although the residue of organic solids was always higher in these preparations of the vitamin than in the corresponding products obtained from liver.

Physicochemical properties of the factor (vitamin H) curative of egg white injury, T. W. BROWN and P. GRÖGER (*Jour. Biol. Chem.*, 131 (1939), No. 2, pp. 761-766).—By means of electrodialysis experiments, using concentrates of varying degrees of purification but containing a low concentration of electrolytes, it was found that the factor (vitamin H) curative of egg white injury in rats had an isoelectric point between pH 2 and 4, the actual value appearing to be between pH 3 and 3.5. Thus the factor is an amphoteric electrolyte exhibiting acidic properties. "Attempts at precipitation by means of various alkaloids were not successful. The sodium salt of vitamin H is soluble in absolute ethyl alcohol, while the addition of $\text{Ba}(\text{OH})_2$ or of $\text{Ca}(\text{OH})_2$ renders the active principle insoluble in ethyl alcohol."

HOME MANAGEMENT AND EQUIPMENT

Use of time in its relation to home management, J. WARREN [*New York Cornell Sta. Bul.* 734 (1940), pp. 98, figs. 14].—Records were obtained from more than 500 farm families in Genesee County, New York, interviewed in the spring of 1936. Forty-seven households were also interviewed during the summer, fall, and winter to study the effect of season. The material, together with information on family composition and household equipment, is summarized in numerous tables and discussed at length.

On an average 63 hr. per week were used for homemaking, of which 32 hr. was used by the homemakers themselves. Care of the house and food preparation accounted for two-thirds of the time. In households where there were children the homemaker used more time for homemaking and less for sleeping and leisure than in other households. "The care of a child less than 1 yr. of age seemed to require about 1,000 hr. a year over and above the homemaking time required for an adult, in addition to the extra time used for washing." Other phases, including the effects of help, work loads, labor saving devices, labor efficiency, liking for the various activities, financial status, farm and other work, and community activities are also considered.

A study of consumer purchases (*Vermont Sta. Bul.* 463 (1940), pp. 22, 23).—This progress report summarizes the results obtained in an analysis of the village housing data in the consumer purchases schedules for the State (E. S. R. 82, p. 716).

[Equipment studies by the Indiana Station] (*Indiana Sta. Rpt.* 1939, pp. 91, 92).—Progress is reported in continuation of studies (E. S. R., 81, p. 749) on refrigeration in the farm household (including adequate refrigeration for "frozen food" products), by G. Redfield and T. E. Henton; and on small electric mixers (and mixer motors), by Redfield.

A study of electric roasters, P. B. POTTER and E. C. NEALE (*Virginia Sta. Bul.* 325 (1940), pp. 30, figs. 10).—The six roasters, representing popular makes and models, are described (with illustrations) briefly as to construction and accessories. Results of performance tests on the unloaded roaster and of selected cooking tests are reported.

The roasters were of low wattage (1,320). This was of advantage in that it permitted operation on a single house circuit without the need for special wiring, but of disadvantage in requiring a longer period for heating to the required cooking temperature. The performance tests showed that this preheating required from 20 to 40 min. Four of the six roasters showed satis-

factory thermostatic control. In general there were no important differences in performance among the several roasters of different makes.

Actual cooking tests, standardized as to general procedure in preliminary trials, showed that baked goods were more successfully produced in the bottom baking positions of the roaster near the source of heat, that the cooking of vegetables and the roasting of meat were slightly more successful than the baking of cakes and pastries, that a basic meal (meat, vegetables, puddings, and biscuits) sufficient for eight persons could be successfully prepared at one time, and that canning operations were limited to certain low-temperature products. The cost of operation per meal or per product compared closely to that of the electric range, but in many cases may be less due to the smaller size of the appliance that has to be heated and put into operation.

MISCELLANEOUS

Statistical methods for medical and biological students, G. DAHLBERG (*London: George Allen & Unwin; New York: Interscience Pubs.*, [1940]. pp. 232, figs. 13).—This is an elementary introduction to the methods used to ascertain the significance of biological data. The methods are illustrated throughout by examples drawn from medical and biological research.

Methods of statistical analysis, C. H. GOULDEN (*New York: John Wiley & Sons; London: Chapman & Hall*, 1939, pp. VII+277, figs. 15).—An explanation of the principles of statistical analysis and its application with particular reference to agricultural problems.

Analyzing data for relationships, F. A. HARPER ([*New York*] *Cornell Sta. Mem.* 231 (1940), pp. 14, figs. 2).—This memoir deals only with two of the problems, (1) moving averages where both factors are irregular and (2) the method of reducing effects of interserial associations.

Fifty-second Annual Report of [Indiana Station], 1939, J. H. SKINNER, H. J. REED, ET AL. (*Indiana Sta. Rpt.* 1939, pp. 142, figs. 38).—The experimental work not previously referred to is mostly noted elsewhere in this issue.

Fifty-third Annual Report [of Vermont Station, 1940], J. L. HILLS (*Vermont Sta. Bul.* 463 (1940), pp. 31).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Bimonthly Bulletin, [September 1940], edited by W. C. PALMER (*North Dakota Sta. Bimo. Bul.*, 3 (1940), No. 1, pp. 23, figs. 2).—In addition to several articles noted elsewhere in this issue and the customary abstracts, this number contains Research and a North Dakota "Live-at-Home" Program, by H. L. Walster (pp. 2, 3); and North Dakota Farm Prices, by W. L. Ettesvold (p. 22).

NOTES

California University and Station.—Three buildings recently completed on the Davis campus include a \$325,000 library-administration building, a \$60,000 irrigation laboratory, and a \$165,000 chemical laboratory.

Dr. Carl L. Alsberg, since 1937 director of the Giannini Foundation of Agricultural Economics, died November 1, 1940, aged 63 years. Dr. Alsberg was born in New York City, graduating from Columbia University in 1896 and receiving the M. D. degree from the College of Physicians and Surgeons in 1900. After 3 years' further study at the Universities of Strasbourg and Berlin he became instructor in biochemistry at Harvard University, and in 1908 was appointed chemical biologist in the U. S. D. A. Bureau of Plant Industry. From 1912 to 1921 he served as Chief of the Bureau of Chemistry, and from 1921 to 1933 was director of the newly established Food Research Institute and dean of graduate study in Stanford University.

Dr. Lindsay A. Crawford, assistant professor of agricultural economics and assistant agricultural economist in the station and the Giannini Foundation, resigned, effective January 1, to become assistant secretary of the Berkeley Bank for Cooperatives of the U. S. D. A. Farm Credit Administration.

Recent appointments include Dr. Dorothy S. Thomas, director of research in social statistics at the Yale University Institute of Human Relations, as professor of rural sociology in the College of Agriculture and rural sociologist in the Giannini Foundation and the station; Dr. H. R. Josephson, assistant forester in the California Forest and Range Experiment Station, as assistant professor of forestry and assistant forest economist; and Dr. C. M. Rick as instructor in truck crops and junior geneticist.

Connecticut State Station.—A two-story brick office and laboratory building has been completed at the Tobacco Substation at a cost of about \$75,000.

Kansas College and Station.—C. K. Otis has resigned as instructor in agricultural engineering and assistant in agricultural engineering investigations.

Maine Station.—Dr. Raymond Pearl, head of the department of biology from 1907 to 1918 and since 1923 associated with the biological, biometrical, and statistical work of Johns Hopkins University, died November 17, 1940, aged 71 years. A native of New Hampshire, he was graduated from Dartmouth College in 1899 and received the Ph. D. degree from the University of Michigan. He served as instructor in the latter institution from 1912 to 1916 and in the University of Pennsylvania from 1906 to 1907. He was also associated with many other institutions as special lecturer or consultant. In recent years he had been especially interested in population studies, and he was the author of a long list of articles on this and other subjects, including *Modes of Research in Genetics*, 1915; *The Nation's Food*, 1919; *The Biology of Population Growth*, 1925; and *The Natural History of Population*, 1938.

Mississippi College and Station.—Frank J. Welch has been appointed professor and head of the department of agricultural economics.

Nebraska University and Station.—Recent appointments include Dr. M. W. Felton as instructor in plant pathology and assistant plant pathologist and Dr. Lester E. Hanson as instructor in animal husbandry.

Ohio Station.—H. R. Moore, associate in rural economics, resigned November 15, 1940. Dr. Byron T. Shaw and W. A. Junnila have been added to the staff as assistants in agronomy and agricultural engineering, respectively.

EXPERIMENT STATION RECORD

VOL. 86

March 1942

No. 3

IMPACTS OF THE WAR ON AGRICULTURAL SCIENCE AS INDICATED BY THE DECEMBER SOCIETY MEETINGS

So many of the scientific societies of agricultural interest hold their annual meetings in late December that this period normally assembles more research workers in agriculture than any other of the year. For this reason these gatherings furnish an unusual opportunity to obtain a cross section of current thought and trends in some of the most important fields. In this respect, the 1941 meetings were no exception. Although formulation of their programs was well advanced before Pearl Harbor, the war and its impacts inevitably permeated whatever was said and done.

Three main groups of these meetings were attended by representatives of the Office of Experiment Stations. The largest in point of numbers and constituent bodies was that at Dallas, Tex., centering around the American Association for the Advancement of Science and including among others the American Phytopathological Society, the Society for Horticultural Science, the Society of Plant Physiologists, and the Mycological Society, the Genetics Society, and the Potato Association of America. A second group was that of nation-wide social science societies, held in New York City and including among others the American Farm Management Association and the Rural Sociological Society of America. The third was held in San Francisco and included the American Association of Economic Entomologists and the Entomological Society of America. All of these groups were largely attended, and there was the customary substantial representation from the Federal Department of Agriculture and the land-grant colleges and experiment stations.

One of the organizations giving special attention to the war situation was the American Phytopathological Society. This society scheduled a panel discussion, sponsored by its extension work and relations committee and having as its topic for discussion Plant Pathology in Relation to National Defense and Post-War Readjustments. The meeting was opened by Director C. R. Orton of West Virginia, who took up the national emergency programs as to crop production

and garden goals and set forth the plant disease program involved. Other speakers drew attention to the opportunity for increased service to Latin America, the fungicide and spray machinery situation, and the need of better transmission of research findings to the farm. On this last point, it was stated that less than half the States now have extension plant pathologists. In an attempt to remedy some of the difficulties in this direction, a group of southern plant pathologists set aside their original program for a special conference to consider what they might do of a wartime value and formulated simple, specific directions for the control of tomato wilt, sweetpotato wilt, and other *Fusarium* wilts of southern crops.

The society as a whole voted to affiliate with the American Society of Agricultural Sciences (E. S. R., 83, p. 291). Thereby it became the first society in this country to effect association with this good-neighbor group established to promote helpful relationships among the agricultural scientists of the American Republics.

Probably the most significant action of the phytopathologists was their formation of a war emergency committee, consisting of their retiring president, Dr. J. G. Leach of West Virginia, Dr. E. C. Stakman of Minnesota, Dr. R. P. White, formerly of the New Jersey Stations, and their newly elected president, Dr. L. M. Hutchins of the U. S. D. A. Bureau of Plant Industry. Regional representatives for the New England, Middle Atlantic, Southern, Upper Mississippi Valley, and Pacific Divisions and representatives for plant quarantine, research, extension, and fungicide manufacture were also designated.

A tentative program of war services dealt with such matters as the codifying for immediate use of existing information on plant disease prevention, an expanded extension service, redirection of current research programs toward emergency uses and increase of special emergency experimentation, reexamination of long-time basic research projects, intensification of plant disease survey work, tightening of plant quarantines, and the holding of regional conferences as a basis for developing coordinated action and research programs to meet war needs in the different areas. Reports were received from several States which indicated that already energetic work was proceeding within the experiment stations to reconstruct their departmental research programs to meet war emergency needs.

The Genetics Society of America adopted resolutions referring to the continuity of fundamental research, now destroyed by war in almost all parts of the world, as "probably the most important investment that can at present be made for the benefit of the post-war period." It urged upon Congress and the Federal Government "the importance of safeguarding the continued prosecution of fundamental research by those institutions which are now supported by Federal funds."

The sociological discussions in New York City centered very definitely around the war situation. One session dealt with rural population and national defense, and another with an agricultural program for defense and the post-war period. Rural health received emphasis in a number of programs, notably in an appeal by Dr. M. L. Wilson of the U. S. D. A. Extension Service for a wide use of our knowledge of nutrition in carrying out agricultural policy and by Miss Dorothy Dickens of Mississippi on the family and national defense. There was also a session on rural institutions and national defense, in which the school and the church received special attention. Still another set of papers dealt with the integration of social research in the Americas and cultural barriers to American solidarity. Much interest was shown by the rural sociologists as a group in the organization of their research for maximum effectiveness on a wartime basis and the need of making readily and widely available whatever findings could be synthesized and applied in emergency production.

The entomological meetings at San Francisco naturally drew their attendance largely from the Western States, but the problems considered in the various papers and conferences represented the major phases of national entomological effort. One of the most profitable sessions of the economic entomologists developed in the extension section where the entomologists' place in national defense was discussed. It was pointed out that 32 entomologists are following their profession as commissioned officers in the armed forces, 10 of whom are in the Navy and 22 in the Army. In other instances, professional entomologists are cooperating with military authorities in sand fly and mosquito control, location of camps, etc. The need for adjustments of long-time research projects was mentioned. It was pointed out that large-scale operations are probably essential during the present emergency. Several authorities on insecticides mentioned the shortage of various essential materials. For example, many of the oils needed in the West are now going for aviation purposes; rotenone can no longer be obtained in quantity; enough arsenic is difficult to get at the present time. The association reaffirmed its desire to be of service in any way possible during the present state of emergency and expressed its willingness to cooperate with other groups with which its service may be coordinated.

Thus regardless of the place of assembly or the field of special interest, we find agricultural science mobilizing to render a maximum of assistance. In these meetings plant pathologists in Dallas, rural sociologists in New York City, and economic entomologists in San Francisco alike demonstrated the solidarity of the personnel engaged in agricultural research in the Nation and by typically democratic procedures indicated distinct progress in reorganizing their work to meet the new conditions and needs.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the Vermont Station] (*Vermont Sta. Bul.* 475 (1941), p. 29).—Work on the source and elimination of lead contamination in maple sirup is reported by C. H. Jones as finished, with a marked drop in the lead content of maple products resulting from the abandonment of terneplate and other soldered equipment.

The chemical composition and apparent digestibility of nutrients in smooth brome grass harvested in three stages of maturity, J. SOTOLA. (Wash. Expt. Sta. and State Col.). (*Jour. Agr. Res.* [U. S.], 63 (1941), No. 7, pp. 427-432).—The protein content of the dry matter of smooth brome grass clippings, taken at regular intervals throughout the growing season, was found to decrease progressively from 13.61 to 4.02 percent. Crude fiber increased from 19.77 to 35.92 percent and plant height from 4.5 to 36 in. The calcium content declined from 0.37 to 0.24 percent and phosphorus from 0.32 to 0.13 percent during the same interval. It was further found that delaying the grazing of smooth brome grass until it is 10 in. tall does not decrease the nutritive qualities, and the carrying capacity appears to be greatly increased. Brome grass up to a height of 10 in. retains its highly digestible character. The dry matter was 81 percent digestible at the 4- and 10-in. stages and only 55.8 percent digestible at the 36-in. stage. Crude protein, crude fiber, and nitrogen-free extract followed similar trends. Smooth brome grass retains its high nutritive qualities to a more advanced stage of maturity than does crested wheat grass, and at identical stages of growth is superior to it in digestible crude protein and total digestible nutrients.

Estudios sobre la raíz de la yuca [Cassava roots] (*Puerto Rico Univ. Sta. Bien. Rpt.* 1939-40, Span. ed., pp. 54-56).—Work reported upon under this heading by H. Cruz Monclova includes analyses of three varieties of cassava roots.

Effect of cupric oxychloride cement on microorganisms, M. A. FARRELL, and R. T. WOLFF. (Pa. State Col.). (*Indus. and Engin. Chem.*, 33 (1941), No. 9, pp. 1185-1188, fig. 1).—Growth of molds (8 dermatophytic species) was markedly inhibited after contact with cupric oxychloride cement ("Hubbel-lite"); that of bacteria (18 species of 12 genera from various substrates) was inhibited by a longer exposure and to a less marked degree. The toxic properties of this cement were retained after washing for 6 hr. in running water.

Determination of nitrate-nitrogen with a photoelectric colorimeter, T. O. BEBEE. (N. Dak. Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 3, pp. 185-191, figs. 3).—The limitations of the phenoldisulfonic acid method for soil nitrate-nitrogen determinations are considered with a view toward development of a more rapid, sensitive, and accurate technic. The use of the Evelyn photoelectric colorimeter¹ was found to be especially valuable for making accurate and rapid measurement of nitrate content as given by the phenoldisulfonic acid method. The colorimeter was found to be especially valuable in the presence of extrane-

¹Evelyn, K. A., *Jour. Biol. Chem.*, 115 (1936), No. 1, pp. 63-75, figs. 3.

ous colors, semiturbid solutions, and small amounts of nitrates. Standard solutions are not needed after the instrument has been calibrated.

New equipment for wheat quality testing, R. H. HARRIS (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 1, pp. 4-6, figs. 2).—The recording dough mixer has been scaled down to a "micro" size which has many mechanical features in common with the larger machine, and which may be enclosed in an air-conditioned cabinet to prevent environmental influences from affecting the results. Smaller quantities of flour than are required by the larger mixer can be used, and less time is consumed in making a test. The curves produced by the micro mixer resemble in general those drawn by the larger machine. The use of smaller quantities of flour is very desirable in plant-breeding and plant-nutrition studies, in which the quantity of available material is necessarily limited.

Farm production of sugarcane sirup, C. F. WALTON, JR., EL. K. VENTRE, M. A. MCCALIP, and C. A. FORT (*U. S. Dept. Agr., Farmers' Bul.* 1874 (1941), pp. II+38, figs. 14).—This publication describes recent improvements in the procedures recommended for making sirup of better and more uniform quality. The equipment and methods described are those most practicable for small farm or community plants. Considered are the use of sugarcane for sirup; production of sugarcane sirup in the United States; composition of sugarcane juice; harvesting; location, lay-out, and size of the plant; extracting, treating, and evaporating the juice; how to prevent sugaring; removing sediment from sirup; canning; marketing; cost of making sirup; composition and food value; and byproducts.

Commercial production of dessert wines, M. A. JOSLYN and M. A. AMERINE (*California Sta. Bul.* 651 (1941), pp. 186, figs. 14).—Following a brief introduction and a few pages concerned with the economic status of the California wine industry, the authors take up the types and composition of dessert wines; the principles of their manufacture; winery design, equipment, and operation; directions for making red dessert, sweet, white dessert, and sherry and other rancio-flavored wines and vermouth and related products; grape concentrate and caramel sirup; clarification and stabilization; preparation for marketing; bacterial diseases and other disorders of dessert wines; and analyses. Selected references for further reading are appended.

Commercial production of brandies, M. A. JOSLYN and M. A. AMERINE (*California Sta. Bul.* 652 (1941), pp. 80, figs. 9).—This bulletin contains an introduction and a résumé of the economic status of the industry in California, together with sections on the composition of brandies and the factors influencing it, classification of brandies, principles of brandy making, distillery operation, preparation for market, analysis of beverage and fortifying brandies, and selected references for further reading, and an index. The problems of the California beverage-brandy industry are discussed.

AGRICULTURAL METEOROLOGY

Climate and man: Yearbook of Agriculture 1941 (*U. S. Dept. Agr. Yearbook* 1941, pp. XII+1248, figs. 501).—This volume is the sixth in this series (*E. S. R.*, 84, p. 686) on some major aspect of science fundamental to our agricultural resources. Following a foreword by C. R. Wickard, and a summary by G. Hambidge (pp. 1-64), the volume is subdivided into five parts, as follows:

Part 1. *Climate as a world influence*.—Climatic Change Through the Ages, by R. J. Russell (pp. 67-97) (coop. La. State Univ.); Climate and the World Pattern, by D. I. Blumenstock and C. W. Thornthwaite (pp. 98-127); and The How and Why of Weather Knowledge, by F. W. Reichelderfer (pp. 128-153).

Part 2. *Climate and agricultural settlement.*—The Settlement of the Humid East, by C. O. Sauer (pp. 157-166) (Univ. Calif.); Climate and Settlement of the Subhumid Lands, by G. T. Trewartha (pp. 167-176) (Univ. Wis.); Climate and Settlement in the Great Plains, by C. W. Thornthwaite (pp. 177-187); Climate and Settlement of the Arid Region, by R. W. Bailey (pp. 188-196); Settlement and Cultivation in the Summer-Dry Climates, by J. Leighly (pp. 197-204) (Univ. Calif.); The Colonization of Northern Lands, by V. Stefansson (pp. 205-216); Climate and Settlement in Puerto Rico and the Hawaiian Islands, by J. Thorp (pp. 217-226); Climate and Future Settlement, by J. O. M. Broek (pp. 227-236) (Univ. Calif.); Comfort and Disease in Relation to Climate, by J. Hirsh (pp. 237-245); and Health in Tropical Climates, by R. G. Stone (pp. 246-261).

Part 3. *Climate and the farmer.*—Climate and Soil, by C. E. Kellogg (pp. 265-291); Effects of Climatic Factors on Growing Plants, by A. C. Hildreth, J. R. Magness, and J. W. Mitchell (pp. 292-307); Influence of Climate and Weather on Growth of Corn, by M. T. Jenkins (pp. 308-320); Climate and Small Grains, by S. C. Salmon (pp. 321-342); Climate and Sorghum, by J. H. Martin (pp. 343-347); Climate and Cotton, by C. B. Doyle (pp. 348-363); Climate and Tobacco, by W. W. Garner (pp. 364-372); Climate and Vegetable Crops, by V. R. Boswell and H. A. Jones (pp. 373-399); Climatic Adaptation of Fruit and Nut Crops, by J. R. Magness and H. P. Traub (pp. 400-420); Climatic Relations of Sugarcane and Sugar Beet, by E. W. Brandes and G. H. Coons (pp. 421-438); Climate and Forage Crops, by O. S. Aamodt (pp. 439-458); Climate and Grazing, by W. R. Chapline and C. K. Cooperrider (pp. 459-476); Climate and the Nation's Forests, by R. Zon (pp. 477-498); Climate and Plant Diseases, by H. B. Humphrey (pp. 499-502); Insects and the Weather, by J. A. Hyslop (pp. 503-507); Climate and Livestock Production, by A. O. Rhoad (pp. 508-516); and Climate in Relation to Worm Parasites of Livestock, by J. T. Luckner (pp. 517-527).

Part 4. *The scientific approach to weather and climate.*—Flood Hazards and Flood Control—The Hydrologic Cycle, by Benjamin Holzman (pp. 532-536), Some Climatic Factors That Affect Run-Off, by G. W. Musgrave (pp. 536-545), Evaporation and Transpiration, by C. W. Thornthwaite and B. Holzman (pp. 545-550), Storms and Floods, by B. Holzman and A. Showalter (pp. 551-557), Snow Melt, by C. L. Forsling (pp. 557-560), Land Use in Flood Control, by A. C. Ringland and Otto E. Guthe (pp. 561-565), and Flood Forecasting, by M. Bernard (pp. 565-578); How the Daily Forecast is Made, by C. L. Mitchell and H. Wexler (pp. 579-598); The Scientific Basis of Modern Meteorology, by C. G. Rossby (pp. 599-655); and Amateur Forecasting From Cloud Formations, by C. G. Rossby (pp. 656-661).

Part 5. *Climatic data, with special reference to agriculture in the United States.*—World Extremes of Weather (p. 664); The Climates of the World, by W. W. Reed (pp. 665-684); Climate and Weather Data for the United States, by J. B. Kincer (pp. 685-699); Climates of the United States (pp. 701-747); Climates of the States (including, for each State, climatic summary tables, precipitation and temperature tables, special frost tables, maps, and supplementary climatic notes by various authors) (pp. 749-1210); and Climates of the Territories and the West Indian Islands (pp. 1211-1228).

Physical climatology, H. LANDSBERG (*State College: Pa. State Col., 1941, pp. XII+283, figs. 79*).—The four chapters of this book deal, respectively, with collection and use of climatic data, climatological elements, composition of climatic elements, and applied climatology.

Climate: The limiting factor in Hand County Agriculture, D. C. MYRICK (Coop. S. Dak. Expt. Sta.). (*U. S. Dept. Agr., Bur. Agr. Econ., 1941, F. M. 25,*

pp. [3]+50, figs. 5).—The author summarizes climatic conditions in relation to agriculture in this South Dakota area over 78 seasons (1862-1939). In 60 percent of the seasons significant limits were put on crop yields by climate. This factor is discussed as it relates to agricultural planning.

Notes on the climate of the south Chinese-Tibetan borderland, J. HANSON-LOWE (*Geog. Rev.*, 31 (1941), No. 3, pp. 444-453, figs. 3).

A new coefficient of humidity and its application to the United States, P. E. CHURCH and E. M. GUEFFROY (*Geog. Rev.*, 29 (1939), No. 4, pp. 665-667, figs. 2).—The authors have tested A. Ångström's coefficient of humidity² by constructing January and July maps of the United States, using data from the climatic summaries published by the U. S. Weather Bureau, and computing coefficients for 548 stations and drawing the isopleths. There is a discussion of the value of this coefficient of humidity, which attempts to express soil moisture conditions, toward a surplus or deficiency of water, by a numerical figure.

Tree-ring analysis and dating in the Mississippi drainage, F. HAWLEY (*Chicago: Univ. Chicago Press*, [1941], pp. XI+110, pls. 8, [fig. 1]).—Two papers are appended: Reflection of Precipitation and Temperature in Tree Growth of the Central Mississippi Area, by M. M. Wedel and F. Hawley (pp. 45-49), and A New Dendrochronograph, by E. J. Workman and F. Hawley (pp. 101-103). Over six pages of references are given.

Monthly Weather Review, [June-August 1941] (*U. S. Mo. Weather Rev.*, 69 (1941), Nos. 6, pp. 169-200, pls. 10, figs. 9; 7, pp. 201-227, pls. 10, figs. 4; 8, pp. 229-256, pls. 10, figs. 18).—In addition to meteorological, climatological, solar radiation, and sunspot data, the following papers are included:

No. 6.—The Midwest Storm of November 11, 1940, by A. J. Knarr (pp. 169-178).

No. 7.—The Areal Distribution of Mean Annual Rainfall Over the Island of Hispaniola, by L. Alpert (pp. 201-204); Calibration of a Weather Bureau Tipping-Bucket Rainage, by D. A. Parsons (p. 205) (*U. S. D. A.*); and An Alternative Form of Potential Vorticity, by H. Arakawa (p. 206).

No. 8.—A New Type of Temperature Graph for the Geographer, by G. F. Deasy (pp. 229-232); and Some Pressure-Precipitation Trend Relations, by J. B. Kincer (pp. 232-235).

Hydrologic studies (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1941, *SCS-TP-39*, pp. [445], figs. [274]; *SCS-TP-41*, pp. [239], figs. [144]).—The first of these compilations of rainfall and run-off data deals with the watersheds of the Shelby Loam and Related Soils Conservation Experiment Station, Bethany, Mo., 1933-40, by A. W. Zingg (coop. Mo. Expt. Sta.); the second with the watersheds of the Arkansas-Louisiana-East Texas Sandy Lands Conservation Experiment Station, Tyler, Tex., 1931-39, by O. C. Word, Jr. (coop. Tex. Sta.).

Daily river stages at river gage stations on the principal rivers of the United States, M. BERNARD (*U. S. Dept. Agr., Weather Bur., Daily River Stages*, 36 (1938), pp. III+170, pl. 1).—This is the usual annual volume (*E. S. R.*, 82, p. 260) continuing the record through 1938.

Soil and water conservation instruments.—I, Notes on the operation of the Fergusson recording rain and snow gage, D. A. PARSONS and F. W. BLAISDELL (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1941, *SCS-TP-44*, pp. [1]+24, figs. 3).

Flood-forecasting service in Pennsylvania, J. W. MANGAN (*Jour. Amer. Water Works Assoc.*, 33 (1941), No. 2, pp. 213-218).

² *Geog. Ann.*, 18 (1936), pp. 245-254.

SOILS—FERTILIZERS

[Soil investigations at the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Bien. Rpt. 1939-40, Span. ed., pp. 59-64*).—Work is noted by B. G. Capó, F. Famírez Silva, J. A. Bonnet, P. Richardson, and F. Méndez on the quantities of assimilable nutrients in Puerto Rico soils and increase in crop yields due to fertilizer applications.

[Soil investigations by the Vermont Station] (*Vermont Sta. Bul. 475 (1941), pp. 20-21, 22*).—Investigations are reported by A. R. Midgley on the following: Effect of various amendments on the conservation of cattle manure, effect of lime and organic matter on boron fixation and availability in soils, and effect of slope, plant cover, and contour tillage on erosion and water run-off on permanent pastures.

Morphological classification of soil structure, C. C. NIKIFOROFF. (U. S. D. A.). (*Soil Sci., 52 (1941), No. 3, pp. 193-211, pls. 2*).—A detailed discussion of a system of soil-structure classification is presented. Soil structure is considered as denoting an arrangement of the soil material in which the primary particles of such a material are held together by ties stronger than the ties between adjacent aggregates. Soil structure is classified into types, classes, grades, and species.

A double centrifuge tube for the separation of soil minerals by means of heavy liquids, C. D. JEFFRIES. (Pa. Expt. Sta.). (*Soil Sci., 52 (1941), No. 2, pp. 167-171, pl. 1*).—A double centrifuge tube has been devised which is found to meet the requirements for completeness of separation of soil minerals. The equipment and method of procedure is described in detail.

Warren County soils, H. WASCHER and R. S. SMITH (*Illinois Sta. Soil Rpt. 70 (1941), pp. 30, figs. 11, map 1*).—This survey adds 342,270 acres to the total area covered by the State soil survey (U. S. R., 84, p. 442).

Natural land types of Massachusetts and their use, A. B. BEAUMONT (*Massachusetts Sta. Bul. 385 (1941), pp. 16, figs. 2*).—Soil type, slope, stoniness, and erosion were mapped in detail for 48 soil types in 17 series on 13,211 acres. Slope was shown to be an important factor affecting land use in dairy farming. Stoniness, however, was found to be more important. Slight erosion was found to be the predominant type. Only 3.8 percent of the area surveyed showed no erosion, thus indicating that erosion was quite extensive. The classification of land into types based on natural characteristics is illustrated by means of the categories set up for one county. It is suggested by the author that this classification is of special value in connection with large-scale planning. The proposed classification is based on information given in the soil surveys of the State and on other factors obtained from a small amount of field work. The author suggests that, since this classification is a natural one, it must be applied in connection with economic and social factors.

An experimental study on the development of adobe structures in soils, C. W. CHANG. (Calif. Expt. Sta.). (*Soil Sci., 52 (1941), No. 3, pp. 213-227, pls. 2, figs. 3*).—Adobe structure may be determined by the drying and breaking of fine-textured soils. If the macroaggregates produced on breaking have smooth cleavage planes and angular edges, the soils possess typical adobe structure. The presence or absence of typical adobe structure is not correlated with particle-size distribution; swelling and shrinkage; moisture equivalent; base-exchange capacity; absorbed Ca, Mg, or Na; pH; vapor-pressure curves of the colloidal fraction; or type of clay present. Typical adobe structure appears to be distinguished by relatively great resistance to crushing pressure, low destructible porosity, high dispersion ratio, low percentage of water-stable aggregates, and high angularity

of the macroaggregates. A large amount of montmorillonitic clay in soils will tend to give rise to adobe structure, whereas a small amount of total clay or a large amount of kaolinitic clay or even of flocculated montmorillonitic clay will give rise to nonadobe structures. Kaolinitic clays, if properly dispersed, however, also may develop macroaggregates having smooth plane surfaces and angular edges and, therefore, may also produce adobe structure.

Soils in relation to fruit-growing in New York.—XV, Seasonal and soil influences on oxygen and carbon-dioxide levels of New York orchard soils, D. BOYNTON ([*New York*] *Cornell Sta. Bul.* 763 (1941), pp. 43, figs. 7).—In this contribution (E. S. R., 81, p. 43), evidence is presented that in the soil air, other conditions remaining constant, the oxygen percentage decreases and carbon dioxide percentage increases with increased depth, increased temperature, and decreased air space in the soil pores. During the greater part of the growing seasons included in the study oxygen stayed close to 20 percent and carbon dioxide below 1 percent of the soil-air volume in gas samples collected at the 1-ft. depth. Soils having less than about 10 percent of their volume as pore space unoccupied by water when they are at field-moisture capacity may be poorly drained at times. In two of the heavier profiles studied, as the ground water receded below the 3-ft. depth the oxygen content of the soil air at 3 ft. increased markedly. Frequently a month or more elapsed before the oxygen level attained a maximum. It was apparent that with some soil layers drainage in itself may not result in good aeration. Apparently anaerobic conditions may exist at times in the macropore space of orchard subsoils, and restricted oxygen content and high carbon dioxide content may occur. It is considered probable that both the analysis of the gas in the macropores, and the quantity and distribution of pore space in which there is opportunity for gas exchange with the outer atmosphere, should be considered in estimating the aeration of a soil layer. It is concluded, tentatively, that the larger pores may serve not only as drainage channels and as aerating systems, but also in influencing the ramification of roots.

Movement of carbon disulfide vapor in soils, R. M. HAGAN (*Hilgardia* [*California Sta.*], 14 (1941), No. 2, pp. 83–118, figs. 13).—The relation between each of several soil factors and the movement of carbon disulfide through the soil are considered. A method is presented for measuring the movement of vapor through the soil under carefully controlled soil conditions. Although specifically designed for this problem, the author suggests that the method may be useful in general studies on soil aeration and structure.

Chlorate distribution and the effect of nitrate concentration on chlorate toxicity in soil columns, R. S. ROSENFELS and A. S. CRAFTS. (Coop. U. S. D. A.). (*Hilgardia* [*California Sta.*], 14 (1941), No. 2, pp. 71–79).—The use of sodium chlorate in weed control has created a need for more information on the action of chlorate in the soil. In experiments with four soils to determine whether a percolating solution of chlorate may wash the nitrate out of the upper layers and concentrate it near the bottom of the soil column, it was found that when sodium chlorate percolates through a column of soil some of the nitrate of the soil is washed down to lower levels. The concentration of the nitrate produced by this washing down reduces the toxicity of chlorate. In view of this fact, the killing effect on deep-rooted plant may not be so great as it is near the surface, even though the chlorate concentration may be uniform throughout the depth penetrated.

Proper land use leads to conservation, W. J. LIDDELL (*Miss. Farm Res.* [*Mississippi Sta.*], 4 (1941), No. 9, p. 1).—A general discussion of the economic and social implications of soil conservation. The relation of soil conservation to national defense is emphasized.

Erosion and related land use conditions on the West Tany Creek demonstration project, Kansas, R. G. DUNMIRE (*U. S. Dept. Agr., Soil Conserv. Serv., Erosion Survey, 1940, No. 21, pp. [1] + 25, figs. 10, map 1*).—This is a continuation of the series previously noted (*E. S. R.*, 85, p. 733).

Progress report of the Navajo Soil and Water Conservation Experiment Station, Mexican Springs, New Mexico, 1934–1939, D. S. HUBBELL, J. L. GARDNER, and G. L. SHERMAN (*U. S. Dept. Agr., Soil Conserv. Serv., 1941, SCS-BSE-9, pp. [99], figs. 17*).—This report presents a discussion of the general problem area along with a detailed account of the climatic, land use, soils, and geologic relations of the problem-area proper. Results of investigations designed to determine run-off characteristics from small and large watersheds and the effect of diverting arroyo waters on range and farm lands are presented.

Devising methods for controlling erosion on New Hampshire potato fields. (Coop. U. S. D. A.). (*New Hampshire Sta. Bul. 330 (1941), pp. 24–25*).—Erosion data by W. H. Lyford are noted.

Cropping systems that help control erosion, O. E. HAYS and N. CLARK. (Coop. U. S. D. A. et al.). (*Wisconsin Sta. Bul. 452 (1941), pp. 23, figs. 12*).—This is an illustrated publication showing the effect of undesirable and desirable cropping practices on soil and water losses. Based on soil losses from the soil conservation experiment station at La Crosse, it was found that the 3-yr. rotation commonly practiced in the area does not give adequate control of erosion except under very limited conditions. Based on the results of the La Crosse experiments, the authors present recommendations for various cropping practices providing for the best use of the land.

A revised nomenclature of forest humus layers for the northeastern United States, S. O. HEIBERG and R. F. CHANDLER, JR. (Cornell Univ. et al.). (*Soil Sci.*, 52 (1941), No. 2, pp. 87–99, pls. 3).—Various types of forest humus layers are described in sufficient detail to enable the soil surveyor to recognize them in the field without the assistance of experienced identification.

Mineral composition of freshly fallen white pine and red maple leaves, W. H. LYFORD, JR. (*New Hampshire Sta. Tech. Bul. 77 (1941), pp. 12*).—The author reports determinations of the ash content and the composition of the ash of the foliage from red maple and from white pine growing in Gloucester, Brookfield, Essex, Paxton, and Woodbridge soils. The red maple leaves from the trees on Gloucester sandy loam averaged 6.21 percent of ash, of which about one-third was silica. Pine needles from trees on the same soil averaged 2.62 percent of ash, of which about one-seventh was silica. The red maple leaves had a calcium content lower than that of the pine needles. There was a tendency toward constancy from one year to another where high ash content was observed, but material from the same species on the same soil type showed considerable variation in ash composition from one site to another. Also, in years when the red maple leaves had a high content of ash components, pine needles grown nearby had a low ash-component content and vice versa. No outstanding differences due to soils may be expected in the ash analyses of the leaves of red maple and white pine growing on Gloucester, Brookfield, Essex, Paxton, or Woodbridge soils.

Synthetic soil as a bacteriological culture medium, H. J. and J. E. CONN. (N. Y. State Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 2, pp. 121–136).—Because of soil deterioration when used as a medium for the cultivation of soil bacteria, as well as the complex composition of natural soil, efforts are reported on the development of a synthetic soil in which the bacteriological phenomenon could be studied with fewer complicating factors. A formula for a synthetic soil is given.

A critique of field experiments with plant nutrients, O. W. WILLCOX (*Amer. Fert.*, 95 (1941), Nos. 5, pp. 5-7, 26; 6, pp. 8-11, 24, 26, figs. 2).—A general discussion is presented on the importance of careful planning in establishing experiments so that the results may be analyzed statistically. It is pointed out that when an analysis of variance shows that a visible increase is not significant, the experimenter may find valuable assistance by determining the positions of the experimental yields in relation to the Mitscherlich-Baule normal yield curve.

Laboratory, greenhouse, and field methods of studying fertilizer needs of orchard soils, R. E. STEPHENSON and C. E. SCHUSTER. (Oregon Expt. Sta. coop. U. S. D. A.). (*Soil Sci.*, 52 (1941), No. 2, pp. 137-153).—Results of chemical, greenhouse, and field tests on soils used for orchard cover crops are considered. It is pointed out that no test which fails to give adequate consideration to the physical properties of the soil can be considered a proper basis for orchard soil management practices. It is suggested that physical and chemical tests should be accompanied by greenhouse trials to provide information on the various elements present. These should be followed by long-time trials where the cumulative effect of various fertilizers over a period of years may be established.

Putting fertilizer where it can do the most good, F. E. BEAR. (Rutgers Univ.). (*Com. Fert.*, 63 (1941), No. 4, pp. 26-29).—Several of the factors affecting the efficient utilization of plant nutrients applied to the soil are reviewed. The effect of the method of application of fertilizers in relation to utilization is given special emphasis. The beneficial response from proper placement of fertilizers for potato production is cited as an example of what may be accomplished through proper placement of fertilizers. The need for additional information on the placement of fertilizers for other crops is indicated.

Use of liquid fertilizers for growing vegetables, V. A. TIEDJENS. (N. J. Expt. Stas.). (*Agr. News Letter*, 9 (1941), No. 2, pp. 17-21; also in *Com. Fert.*, 63 (1941), No. 4, pp. 10, 12-13).—A general discussion of the principles, methods, and equipment involved in the use of liquid fertilizers for growing vegetables. The author points out that liquid fertilizer formulas are low in calcium because it is impossible to have appreciable amounts of calcium and phosphoric acid both in solution. It is indicated that if liquid fertilizers are used a good liming program should be followed.

Forty-year studies of nitrogen fertilizers, A. L. PRINCE, S. J. TOTH, A. W. BLAIR, and F. E. BEAR. (N. J. Expt. Stas.). (*Soil Sci.*, 52 (1941), No. 4, pp. 247-261, figs. 2).—The authors present a summary of 40 years' results of cylinder studies with Penn loam soil, involving a comparison of nitrogenous fertilizer materials as determined by the yield of dry matter, the amount of nitrogen in harvested crops, percentage recovery of applied nitrogen in the harvested crops, and the residual effects on the soil. In addition, data are presented on the status of the exchange complex of the soil on which the experiments were conducted.

Factors influencing the availability of the indigenous phosphorus in an acid tropical soil, J. E. A. DEN DOOR (*Soil Sci.*, 52 (1941), No. 2, pp. 101-120, fig. 1).—Results are reported on the effect of crop residues on the availability of indigenous phosphorus in a Java soil. The author suggests that improvement in availability of indigenous phosphorus is brought about by macrobiotic and microbiotic processes. The combined action or cooperation is suggested to consist of the utilization by soil micro-organisms of the sun's energy which was stored in the organic materials and which was liberated from the crop plants and placed at the disposal of the soil micro-organisms. In order to utilize the organic

materials the soil micro-organisms need potassium fertilizer for their own use. Nitrogen fertilizer would also be expected to benefit the action. The importance of utilization of organic residues in tapioca culture is emphasized.

Soil studies with radioactive phosphorus: Significance of biological measurements of the retention of applied phosphorus by soils, S. S. BALLARD and L. A. DEAN. (Hawaii Expt. Sta.). (*Soil Sci.*, 52 (1941), No. 3, pp. 173-183, pl. 1, figs. 2).—The extent of retention of applied phosphorus to the soil was studied by growing tomatoes in various soil and sand cultures to which radioactive phosphorus had been added. Results are also recorded on a comparison of chemical and biological methods for determining the phosphorus-fixing capacity of soils. This soil and species of plant grown were found to affect the rate and total amount of radioactive phosphorus absorbed. The percentage of phosphorus fixation found for various soils was found to be closely related to the values obtained from chemical laboratory studies on the sorption from soil-water systems.

Some effects of volume rate of solution supply and of potassium concentrations on the growth of white clover, G. H. AHLGREN. (N. J. Expt. Stas.). (*Soil Sci.*, 52 (1941), No. 3, pp. 229-235, pl. 1).—Results are reported on the effect of various potassium concentrations and volume rate of solution supply on the culture and yield of white clover grown under greenhouse conditions. Plants supplied daily at the rate of 1 l. with solutions containing 1, 4, and 16 p. p. m. of potassium showed potassium-deficiency symptoms, whereas when 4 l. of these same solutions were supplied daily the deficiency symptoms were greatly reduced at 1 and 4 p. p. m. and had completely disappeared with the 15 p. p. m. treatment of potassium.

Effect of certain orchard practices on the potassium status of a New York fruit soil, W. REUTHER. (Cornell Univ.). (*Soil Sci.*, 52 (1941), No. 2, pp. 155-165).—Investigations are reported on the effect of mulch on the exchangeable potassium content of a New York orchard soil in the Dunkirk series and on the effect of farm manure on the potash status of an orchard soil. The use of liberal amounts of straw mulch or farm manure markedly increased the exchangeable potassium content of the soils under study. The high potassium content of mulch materials should be given more attention in the evaluation of the effects of mulching as an agricultural practice.

The importance of sodium for plant nutrition, I, J. J. LEHR (*Soil Sci.*, 52 (1941), No. 3, pp. 237-244, fig. 1).—The effect of sodium on certain crops and the importance of sodium in relation to potassium are considered. It is indicated that while sodium is not as important as potassium there are several conditions where sodium might be applied to advantage.

The value of liming soils, R. COLEMAN (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 9, pp. 1-2, 7).—The importance of calcium and magnesium in plant growth is discussed. It is pointed out that the cheapest and easiest method of correcting soil acidity and supplying calcium and magnesium is through the use of dolomitic limestone.

AGRICULTURAL BOTANY

The world of plant life, C. I. HYLANDER (*New York: Macmillan Co.*, 1939, pp. XXII+722, [pl. 1, figs. 488]).—"This book was planned and written with the specific purpose of making the laymen familiar with a few of the interesting plants, both native and introduced, which are found in the United States."

The plant world: A text in college botany, H. J. FULLER (*New York: Henry Holt & Co.*, [1941], pp. XI+592, [pls. 2], figs. 306).

The diagrammatic representation of the results of physiological and other experiments designed factorially, F. J. RICHARDS (*Ann. Bot. [London], n. ser., 5 (1941), No. 18, pp. 249-261, figs. 4*).—"A type of diagram is described that enables the results of any experiment of factorial design, including the various interaction effects, to be presented fully and concisely in one plane. Examples of diagrams illustrating the $2 \times 2 \times 2$, $2 \times 2 \times 2 \times 2$, 3×3 , and $3 \times 2 \times 2$ layouts are given and discussed."

The technique and use of mass collections in plant taxonomy, E. ANDERSON (*Ann. Missouri Bot. Gard., 28 (1941), No. 3, pp. 287-292, fig. 1*).

Allium coryi, M. E. JONES, H. B. PARKS. (Tex. Expt. Sta.). (*Herbertia*, 7 (1940), pp. 84-87, fig. 1).—Description and notes are given on this Texas species of onion, which is adapted to both hot dry and moist cool conditions as well as to high and low altitudes. Its excellence as an ornamental is stressed.

A checklist of Amaryllidaceae, tribe Allieae, in the United States, C. V. MOOREN (*Herbertia*, 7 (1940), pp. 68-83).

Species Batorum: The genus *Rubus* in North America.—III, Setosi, L. H. BAILEY (*Gentes Herbarum*, 5 (1941), No. 3, pp. 127-198, figs. 34).—A taxonomic study (E. S. R., 85, p. 315), with key to the species.

Una referencia a todas las especies de *Coffea* conocidas, su distribución geográfica y su literatura original [A reference to all the known species of *Coffea*, their geographic distribution and the original literature thereon], J. C. T. UPHOF (*Café El Salvador*, 11 (1941), No. 129, pp. 604-613).—Included are 141 species, with bibliography.

New or noteworthy Philippine fungi, III, J. M. MENDOZA and S. LEUS-PALO (*Philippine Jour. Sci.*, 75 (1941), No. 2, pp. 165-183, figs. 9).—In this contribution 10 species of *Cercospora* are described as new, and 20 species previously described from extra-Philippine material are for the first time reported from the Archipelago, 10 of these being *Cercosporas* and the rest *Agaricaceae*.

A revision of *Melanconis*, *Pseudovalsa*, *Prosthecium*, and *Titanila*, L. E. WEHMEYER (*Ann. Arbor: Univ. Mich. Press; London: Oxford Univ. Press*, 1941, pp. VIII+161, pls. 11).—This is a monographic revision of the four related sphaeriaceous genera of *Pyrenomycetes*, with keys to the genera and species based primarily on spore characters and secondarily upon stromatic features and conidial stages. The genera regarded chiefly as artificial conceptions with arbitrary boundaries are subdivided into newly named subgenera and sections considered to be natural groups that "will probably be recognized as genera when our knowledge of natural affinities is more complete." With each specific description including conidial stages is a comprehensive synonymy with references and citations of types and pertinent exsiccati, together with records of cultures by the author. An appendix disposes of the several species hitherto referred to the genera *Calospora*, *Massaria*, and *Aglaospora* rendered invalid or questionable by inclusion of their type species in the four genera monographed. The index is complete with page references to the species and genera considered.

Untersuchungen zur Ökologie der höheren Pilze [Investigations of the ecology of the higher fungi], K. FRIEDRICH (*Jena: Gustav Fischer*, 1940, pp. [3]+52+[1], figs. 2).—This monograph (two pages of references) considers various habitat factors in their influences on fungus growth, fungus surveys and associations, and the fungi of mountainous areas. An index is provided.

Contribución para una interpretación correcta del concepto ecológico [Contribution to a correct interpretation of the ecological concept], J. TISCORNIA (*Rev. Asoc. Ingen. Agrón. [Montevideo]*, 13 (1941), No. 1, pp. 14-17).—A general review and discussion of the subject preliminary to the two following papers.

Representación geográfica de los fenómenos periódicos de la vida vegetal [Geographic representation of periodic phenomena (phenology) in the plant world], J. TISCORNIA (*Rev. Asoc. Ingen. Agrón. [Montevideo]*, 13 (1941), No. 2, pp. 20-25, figs. 2; *Eng. abs.*, p. 25).—This paper presents a review of studies by Azzi (E. S. R., 62, p. 314) of the International Institute of Agriculture, Roma, on the establishment of lines similar to isobars and isotherms joining points at which the main growth cycle phases of wheat are developed simultaneously throughout its world zone of distribution. The two most important phenological phases considered are germination and maturity, i. e., the time of sowing (with map showing isophanes) and harvesting the crop. Under conditions of general excess in high or low temperatures the decisive factor in determining the best adapted varieties and the optimum time for sowing is the temperature. On the other hand, with relatively constant temperature the decisive factor is rainfall.

Equivalentes meteorológicos del trigo [Meteorological equivalents for wheat], J. TISCORNIA (*Rev. Asoc. Ingen. Agrón. [Montevideo]*, 13 (1941), No. 3, pp. 28-35; *Eng. abs.*, p. 35).—This is a review of studies by G. Azzi (see above) on meteorological equivalents, i. e., values referring to temperature, rainfall, and other climatic factors which are either optimum or limiting (by excess or deficiency) for the different growth cycle phases of crop plants, with particular regard to wheat.

Symbiosis of leguminous plants and nodule bacteria.—I, **Observations on respiration and on the extent of utilization of host carbohydrates by the nodule bacteria**, G. BOND (*Ann. Bot. [London]*, n. ser., 5 (1941), No. 18, pp. 313-337, fig. 1).—In general, the respiration per unit dry weight of tissue in the nodules of soybeans was found to be about three times that of the roots. At a stage shortly before flowering, the nodular respiration was 25 percent that of the plant as a whole, the roots accounting for 18 and the top for 57 percent. It is assumed that these figures indicate also the respective consumption of carbohydrate for respiratory purposes in the various parts of the plant. Carbohydrate consumption within the nodules of a plant amounted to 16 percent of the total synthesized by the host during the period from shortly before flowering to early fruit formation. For each milligram of N fixed during this period there appeared to have been a consumption of about 19 mg. of carbohydrate within the nodules. The evidence advanced suggests that the bacteria probably accounted for around three-fourths of the respiration of the plant as a whole. The accuracy of these conclusions depends especially on the extent to which the rate of CO₂ formation is a satisfactory basis for comparing the carbohydrate utilization in the katabolism of different biological material. Other possible sources of error are discussed. There are 26 references.

Assimilation des Stickstoffes der Knöllchen durch die Leguminosen [Assimilation of the nitrogen of the root nodules by legumes], M. ALI SADE (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 29 (1940), No. 2, pp. 129-131).

Competition between related strains of nodule bacteria and its influence on infection of the legume host, H. NICOL and H. G. THORNTON (*Roy. Soc. [London]*, *Proc.*, Ser. B, 130 (1941), No. 358, pp. 32-59, figs. 6).—The effects of dominance in competition outside the root system appeared to be of paramount importance in determining which of two *Rhizobium* strains will contribute most to the production of nodules when both are present in the surroundings of their host root system. It thus becomes of practical importance in preparing cultures for commercial distribution to choose strains that not only can produce nodules beneficial to their host but are also dominant in competition with other strains. The intense competition between closely related strains of bacteria may well have a wider importance in its application to pathogenic organisms.

The adaptive enzymes of certain strains of yeasts, H. E. RHOADES. (U. S. D. A.). (*Jour. Bact.*, 42 (1941), No. 1, pp. 99-115, pls. 4).—Nine strains of three species of *Saccharomyces* and one of *Schizosaccharomyces* were studied with regard to the constitutive or adaptive nature of their enzymes toward the fermentation of glucose, mannose, galactose, sucrose, maltose, raffinose, α -methylglucoside, and trehalose.

The carboxylase-cocarboxylase system of *Fusaria*, A. A. TYTELL and B. S. GOULD (*Jour. Bact.*, 42 (1941), No. 4, pp. 513-526, figs. 2).

Amide synthesis in plants.—I, The succinoxidase system in plants, M. DAMODARAN and T. R. VENKATESAN (*Indian Acad. Sci. Proc.*, 13 (1941), No. 6, Sect. B, pp. 345-359), figs. 8).—The presence of succinic dehydrogenase and oxidase was demonstrated in young seedlings and pods of various legumes, though not detected in leaves and shoots of mature plants of the same species or in seedlings of certain other species. A highly active preparation of the enzyme was made from seedlings of gram (*Phaseolus mungo*), and detailed study indicated its properties and behavior to be in all respects analogous to those for muscle succinoxidase. The presence of the enzyme in seedlings and pods of legumes where asparagine formation is known to predominate lends support to the view that succinic acid is a precursor of asparagine in plants.

The effect of thiamine (vitamin B₁) on fermentation of yeast, H. LASER (*Biochem. Jour.*, 35 (1941), No. 4, pp. 488-494, figs. 6).—Not every type of yeast responded with increased fermentation to added thiamin. Thus bakers' yeast reacted regularly, where *Torula utilis* failed to respond at all. Some yeasts reacted immediately after adding the thiamin, and some only after several hours' incubation. Once the rise of fermentation had started it increased with time for the same thiamin dosage. Differences in increased fermentation from different amounts of thiamin acting on the same amount of yeast are therefore more pronounced after some incubation, though the relative increases remain the same. In yeasts reacting by increased anaerobic fermentation, aerobic fermentation was also increased by the same minute amounts of thiamin, the percentage increase being of about the same magnitude as that of anaerobic fermentation. The reaction causing the increased fermentation has a low temperature coefficient. Different amounts of a slowly reacting yeast sample incubated with the same amount of thiamin for 24 hr. showed, as time went on, a relatively greater increase of fermentation with decreasing amounts of yeast. Reduction of thiamin by H₂ in presence of platinum black yielded an irreversibly inactive product. The Na₂S₂O₄-reduced thiamin, when added to yeast in N₂, affected fermentation in the same way as the oxidized form. It is concluded that the reduction of Na₂S₂O₄ is reversible, and that thiamin reduced by it is reoxidized within the living cell.

Morphological and physiological modifications induced in cells by vitamin B₁, M. N. MEISSEL (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S.*, n. ser., 29 (1940), No. 2, pp. 125-128, figs. 2).—It is concluded that organisms needing an external supply of vitamin B₁ (the one-celled *Endomyces magnusii* used) for their development respond to additions of this vitamin to their media not only by accelerated growth and multiplication but also by changes in the structure of their cells and the character of their metabolism. With this vitamin available, the cells underwent morphological and physiological reconstruction and approached the type of cells with anaerobic (fermentative) habit, becoming heavily stored with glycogen and volutine and with chondriome apparatus of sharply different structure. Vitamin B₁ increased the viability of the cells and appeared to protect them from harmful external influences.

Bacterial treatment of seeds as a means of controlling the synthesis of vitamins C and B₁ in the seedlings, A. A. ISSAKOVA (*Compt. Rend. (Dok.)*,

Acad. Sci. U. R. S. S., n. ser., 28 (1940), No. 2, pp. 170-173).—Treatment of barley and wheat seed with certain bacteria and fungi is reported to have increased in some cases and to have decreased in others the synthesis of these vitamins in the resulting seedlings.

Metabolism of ascorbic acid in cowpea plants, M. E. REM. (U. S. D. A. et al.). (*Bul. Torrey Bot. Club*, 68 (1941), No. 6, pp. 359-371, figs. 18).—Ability to increase the total ascorbic acid (determined by indophenol reduction) during darkness continued as long as the stored reserves in the cotyledons remained available. After this the capacity to use carbohydrates in vitamin synthesis was lacking, or if the conversion occurred the rate was so slow that the metabolic loss masked the synthesis. The loss was accompanied by growth, suggesting that the ascorbic acid may be destroyed in respiration or used in some special type of synthesis. The possibility is discussed that the net loss or gain may not represent the magnitude of ascorbic acid synthesis or loss. Evidence is presented indicating that the net magnitude of the diurnal fluctuations in ascorbic acid can be shown only by measurements of absolute amounts in individual organs or in the entire plant. It is suggested that ascorbic acid synthesis during the dependent phase of growth is effected by the reconstitution of a closely related precursor stored in the seed during its development. An influence of the plumule or radicle is unnecessary to effect synthesis of ascorbic acid in the cotyledons. The ability of crushed cotyledons to synthesize the vitamin appears to depend on the size of the particles.

Rooting and growth of leafy stem cuttings stimulated by heteroauxine, L. F. PRAVDIN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 29 (1940), No. 7, pp. 494-496).—Tests on over 20 ornamental plants grouped them into those whose cuttings were stimulated to root formation by heteroauxin, those indifferent to treatment, and those which failed to root whether treated or not.

Influencing plant development with leaf extracts and other organic substances, C. G. VINSON, A. D. HIBBARD, and R. RODNEY. (Univ. Mo.). (*Com. Fert.*, 62 (1941), No. 5, p. 28).—An abstract.

Effect of some organic acid salts on storage of citric acid by leaves of tobacco plants, M. P. PIATNITSKY (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 29 (1940), No. 1, pp. 55-58).—The citric acid content was found to increase in response to mineral salts and water. It is concluded that keeping the leaves in salt solutions or water before curing leads to the mobilization of greater amounts of available malic acid than with curing alone, this acid being the source of the citric acid.

Effect of mineral salts on storage of citric acids by leaves of *Nicotiana rustica* and *Nicotiana glauca*, M. P. PIATNITSKY (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 29 (1940), No. 1, pp. 59-61).—It is suggested that the observed stimulating effect of water and mineral salts on the storage of citric acid may perhaps become of commercial use as a new method of treating the raw leaves for increasing their citric acid content.

Leaf albumins as an index for salt resistance of cotton plants, B. P. STROGONOV and L. OSTAPENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 30 (1941), No. 1, pp. 66-68, fig. 1).—In the tests reported the protein in the plant tissues increased with the concentration of salts in the soil, as did also the plants' resistance to the salts.

[Symposium papers on botany] (*In Cold Spring Harbor Symposia on Quantitative Biology*, VIII. *Cold Spring Harbor, N. Y.: Biol. Lab.*, 1940, vol. 8, pp. 51-62, 102-109, 171-215, figs. [241]).—The following papers, with discussions, are of interest to botany: Some Models of Protoplasmic Surfaces, by W. J. V. Osterhout (pp. 51-62); Plasma-Membrane Structure in the Light of Frost-Hardening

Changes, by G. W. Scarth, J. Levitt, and D. Siminovitch (pp. 102-109); The Intake of Radioactive Isotopes by Living Cells, by S. C. Brooks (pp. 171-180); Salt Accumulation by Plant Cells, With Special Reference to Metabolism and Experiments on Barley Roots, by D. R. Hoagland (pp. 181-194); The Binding of Ions by the Cell Surface, by D. Mazia (pp. 195-203); and The Relations of Bioelectric Phenomena to Ionic Permeability and to Metabolism in Large Plant Cells, by L. R. Blinks (pp. 204-215).

Physiological studies in plant nutrition.—XI, The effect on growth of rubidium with low potassium supply, and modification of this effect by other nutrients—pt. 1, The effect on total dry weight, F. J. RICHARDS (*Ann. Bot. [London], n. ser., 5 (1941), No. 18, pp. 263-296, figs. 8*).—The studies reported are believed to indicate that whereas barley may grow successfully in a high K nutrient solution containing NH_4 salts, only a minimum of Ca, and without Na, it is in such circumstances much more sensitive to K deficiency than usual with other types of solutions. With very low K levels growth very soon nearly ceased, but with Rb added, early growth proceeded almost normally. When the Rb level was high, characteristic abnormalities soon appeared with premature death often following, but a range of Rb concentrations exists over which the element increases total growth many times. Na, Li, and Cs did not have this effect. The effect of Rb on growth depends in a complex manner on the Ca- NH_4 status and the P level of the solution, and the main study here concerned the more thorough investigation of this interaction. On the assumption that excessive accumulation of P within the plant is injurious, the effect of Rb on the uptake of that element may account for the results, which are discussed in detail. Reduction in the P content following Rb application to high Ca-high P treatments led to improved growth and general condition. In treatments with low P supply, where growth was already restricted from this cause, Rb addition was followed by further reduction in growth and accentuation of P deficiency symptoms. Though lowering the P level of the high NH_4 treatment at low K levels reduced the toxicity of the treatment, it appears likely that the severe injury under these conditions was partly due to the NH_4 ion, i. e., to internal accumulation of both P and NH_4 . Both these deleterious accumulations are countered by Rb, hence the strikingly beneficial effect of this element. There are 25 references.

Calcium and phosphorus as they influence manganese in forage crops, W. A. ALBRECHT and N. C. SMITH. (Mo. Expt. Sta.). (Bul. Torrey Bot. Club, 68 (1941), No. 6, pp. 372-380, figs. 5).—The Mn concentration within the crop and the totals taken by it from the soil point to a dual role of calcium carbonate in relation to this trace element in plant nutrition. When calcium carbonate was mixed throughout the soil so as to modify its reaction, the concentration and total Mn in the crops were decreased as the application to the soil and consumption of Ca by the crop increased. However, when the application was placed in the surface soil to increase crop consumption of the Ca even more, the reverse effect on Mn was manifested. When phosphate was applied to provide increasing concentrations, whether in the entire or limited soil volume, the additional P for the crop gave increasing Mn harvest, roughly parallel with the increased crop growth. Combinations of lime and phosphate in the limited soil areas aided the crop in taking more Mn. This work emphasizes the need to consider the beneficial nutritional role of Ca within the plant, on such soils as the Putnam silt loam used, in making Mn available for the plant as reflected in the increased concentrations. There is need also to consider the possible detrimental role of calcium carbonate as it modifies

the soil reaction or other soil conditions and reduces the Mn taken by the crop, possibly to the danger point of Mn deficiency.

The comparative boron content of potato leaves and tubers produced under different cultural conditions, R. B. CARSON, W. E. TOTTINGHAM, and R. MACVICAR. (Univ. Wis.). (*Com. Fert.*, 62 (1941), No. 5, pp. 28-29).—An abstract.

Effects of boron on germination of pollen and growth of pollen tubes in tomato (*Lycopersicum esculentum* Mill.), I. V. VASSILIEV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 30 (1941), No. 6, pp. 532-534).—Boron promoted pollen germination and tube growth when added in the form of boric acid or borax, the best medium tried being a 15 percent sugar solution plus 0.003 percent boric acid.

The germination of maize pollen, R. A. BAIR and W. E. LOOMIS. (Iowa State Col.). (*Science*, 94 (1941), No. 2433, pp. 168-169, fig. 1).—The method developed gave as much as 90 percent germination within 30 min. after inoculation, using a solution containing 0.7 percent agar and 15 percent sucrose held at 60° C. in a water bath and transferred with a pipette to a microscope slide for the test. A major factor for success is the degree of imbedding of the pollen grains in the still-soft agar (the agar percentage, temperature, and cooling rate are important in this connection), best results being obtained when the grains are two-thirds imbedded. Most consistent results also followed use of pollen taken from cut tassels stored overnight to several days at constant temperature and humidity, perhaps because more uniform osmotic values are attained by such preliminary treatment.

Silver nitrate as a stain for use in studies of conduction of liquids in wood, J. W. JOHNSON. (Ohio State Univ.). (*Phytopathology*, 31 (1941), No. 11, pp. 1035-1039, figs. 2).—A silver nitrate solution (2.5 percent in 20 percent ethyl alcohol) was injected into small blocks of green *Pinus ponderosa* sapwood scarred by the California flathead borer *Melanophila californica* larvae. The blocks were then split longitudinally and developed like photographic films, the pattern of precipitated silver on the split surfaces indicating the course of stain movement in the plane of splitting. This method prevents obscuring of the initial pattern by later diffusion of the stain.

Über eine Methode zum Studium der Filtration des Wassers durch den Stengel der Getreidepflanzen [A method of studying the conduction of water through the stem of cereal plants], A. E. WOTSCHAL (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 30 (1941), No. 1, pp. 73-75, figs. 2).—The author describes and illustrates an apparatus and procedure for measuring the conductivity of water through stalks of the small grains.

Methods for continuous estimation of the rate of transpiration in plants, A. E. WOTSCHAL (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 29 (1940), No. 5-6, pp. 422-424, figs. 3).

The vapor pressure gradient above a transpiring leaf, V. L. FRAMPTON and K. LONGFEE. (Cornell Univ.). (*Phytopathology*, 31 (1941), No. 11, pp. 1040-1042, fig. 1).—The vapor pressure gradient above a leaf transpiring under controlled conditions was found to follow the general equation for a forced diffusion.

The growth of isolated cotyledons of *Cucurbita pepo*, R. BROWN (*Ann. Bot. [London]*, n. ser., 5 (1941), No. 18, pp. 175-192, figs. 4).—Using a quantitative method described, the rate of cotyledon development was always highest with the highest levels of water availability, and the rate fell with decrease therein. The data indicated that the reaction of the cotyledon differs according to the surface exposed, and this, together with certain anatomical observations, suggests

that the immediate effect of certain treatments is localized in the surface layers and the effect on the whole cotyledon is secondary. Light depressed the development of the inner surface, but only affected the outer when it was covered by the inner seed-coat membrane. Removal of this membrane enhanced development in light when the outer surface was turned upwards. Some of the effects due to removal of the inner seed-coat membrane were only evident after the connection with the cotyledon had been broken. These are therefore deemed to be aftereffects which were established at an earlier phase. Removal of the seed coat occasioned a sharp fall in dry weight, attributed to leaching out of soluble substances. Two phases in the development of the cotyledon are distinguished, viz, an early phase, extending over about 48 hr., in which water absorption is by imbibition; and a later phase in which absorption is by osmosis.

Natural conditions reproduced in a chamber for studying gas metabolism in plants, A. E. VOTCHAL (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 29 (1940), No. 7, pp. 500-503, figs. 4*).

Responses of some plants to equal and unequal ratios of light and darkness in cycles ranging from 1 hour to 72 hours, H. A. ALLARD and W. W. GARDNER. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 63 (1941), No. 6, pp. 305-330, figs. 10*).—In this study Peking soybean, *Zinnia angustifolia*, wheat, and dill were the test plants, and artificial light alone was used, furnished by a water-jacketed, water-cooled 110-v., 1,000-w. incandescent bulb equipped with reflector, giving about 1,200 footcandles at a distance of 1 ft. The ratios of light to darkness were 1:3; 1:2; 1:1.4; 1:1; 1.4:1; 2:1; and 3:1. Continuous illumination was also employed. The ratio of 1:1, affording 12 hr. of light and 12 of darkness, represented the normal cycle or check. The cycles of total light and darkness varied from 1 to 72 hr. in length, and temperatures were maintained at approximately 77° F., with a relative humidity of about 60 percent in all tests. In most cases, the same ratios of light to darkness did not give the same behavior for any particular plant species. With Peking soybean (short-day plant), increase in the light interval of any given cycle resulted in increased growth and yield of dry matter, but the blooming time depended on both ratio of light to darkness and length of cycle. In *Zinnia* (indeterminate plant), flowering time was not particularly affected, but type of growth, amount of dry matter, and greenness of leafage were materially affected. Dill (long-day plant) was affected in flowering time and in all growth features. It was found that increase in growth and dry matter may accompany two contrasting conditions of light relations. In the one, the dry matter increased with increase in the total amount of light, as where unequal ratios of light and darkness obtained in the same cycle. In the other, increase in length of cycle with maintenance of equal ratios of light and darkness resulted in an increase of dry matter, even though the total amount of light received did not change.

Influence of daylength on stem growth in transverse direction, G. M. PSAREV (*Compt. Rend. [Dok.] Acad. Sci. U. R. S. S., n. ser., 28 (1940), No. 6, pp. 537-539, fig. 1*).—In general, soybean stems increased in length with increase in day length and transversely as the day length grew shorter. Microscopical examination showed the stem swellings due to the more vigorous growth of the xylem.

Effect of daylength on cambial growth, G. M. PSAREV and N. F. NEUMAN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 29 (1940), No. 7, pp. 497-499, figs. 3*).—In soybean the activity of the cambium and the xylem development were stronger with short than with long days, but the two varieties tested varied in their sensitivity to photoperiod.

Frost-resistance of citrus plants as controlled by daylength, S. M. IVANOV (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 28 (1940), No. 8, pp. 736-738*).—That short periods of light increase frost resistance in woody plants and that frost resistance is connected with an earlier completion of the growth period, which in turn is controlled by day length, are well-known facts. As to the mechanism of frost resistance changes in response to day length, the author found that not only was the resistance of young shoots liable to such change, but that the full-formed new twigs and even the stem varied in resistance according to the same factors. This is interpreted to mean that the early lignification induced by short days cannot alone be responsible for the increased frost resistance observed. From the data presented, it appeared obvious that not only was the active growth of the shoots completed sooner, but the functional activity of the cells connected with growth decreased after active growth and lignification had ended. Comparing frost resistance with glutathione content, it was noted that it increased with the reduction in glutathione due to decreased day length. The sugar content in the leaves was also markedly affected by day length variations, but no definite relation to frost resistance was observed here.

Inhibiting action of blue light upon germination of tomato seeds, N. A. ANELL (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser., 28 (1940), No. 3, pp. 267-269*).—Under the influence of blue light the biochemical processes underwent an essential change such as to cause delayed germination. The catalase activity, respiration rate, and fat consumption were notably depressed, whereas the syntheses of disaccharides and in part of starch were heightened. After stopping the irradiation, all seeds then held in darkness for 5-7 days germinated vigorously and were only slightly inferior to the control untreated seeds.

The cytoplasm of the plant cell, A. GUILLIERMOND, trans. by L. R. ATKINSON (*Waltham, Mass.: Chronica Botanica Co., 1941, pp. [10]+247, figs. 152*).—During the past two decades when the majority of cytologists were concerned primarily with chromosomes and genes, much research has been done, particularly in France, on plastids, chondriosomes, microsomes, vacuoles, etc., and the author and others have added greatly to our knowledge of such intracellular elements. This volume comprises a critical review of present knowledge of the cytoplasm and of its morphological constituents. As stated by William Seifriz in the foreword, "One cannot read this book . . . without being profoundly impressed with the thoroughness with which it has been written. No one has yet presented, nor is anyone for a long time likely to present, so complete and authoritative an account of the mitochondria story." He also found the author "as awake to the contributions of the newer cytology as to those of the old." This book is the translation of a new and unpublished French manuscript and not merely an English version of a previous work by the author. A bibliography of about 20 pages, and indexes to authors and to plant and animal names are included.

The proliferation of dandelions from roots, E. NAYLOR. (Univ. Mo.). (*Bul. Torrey Bot. Club, 68 (1941), No. 6, pp. 351-358, figs. 16*).—In moist chambers, proliferating tissue on root cuttings appeared in 2-3 days. The mature root consists largely of phloem parenchyma in which concentric rings of sieve tubes associated with lactiferous ducts are embedded. The new parts originate from the parenchyma of the secondary phloem. Shoots are formed at only the proximal ends of cuttings, and roots only at the distal end or occasionally along the sides.

The main outlines of bacterial classification, R. Y. STANIER and C. B. VAN NIEL (*Jour. Bact., 42 (1941), No. 4, pp. 437-466, figs. 2*).—Following a discussion of the problems involved in the creation of the larger taxonomic units among

the bacteria, an outline is given for what the authors believe to be a more rational approach, and their final arrangement is presented in the form of a key to the divisions, classes, and orders of the kingdom Monera, which is composed of micro-organisms without true nuclei, plastids, or sexual reproduction. There are two pages of references.

Antagonistic relations of microorganisms, S. A. WAKSMAN. (N. J. Expt. Stas.). (*Bact. Rev.*, 5 (1941), No. 3, pp. 231-291).—This general review (373 references) takes up the survival of pathogens in soil and water; symbiosis and antibiosis; antagonistic effects of bacteria, of fungi, and of animal forms; chemical nature of the antagonistic substances; and disease control with antagonistic micro-organisms.

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact.*, 42 (1941), No. 1, pp. 133-153).—The following are of botanical interest: Bacterial Metabolism of the C-dicarboxylic acids, by L. O. Krampitz, M. F. Utter, and C. H. Werkman (pp. 139-140) (Iowa State Col.); Assimilation of $C^{14}O_2$ by Heterotrophic Bacteria, by H. D. Slade, H. G. Wood, A. Hemingway, A. O. Nier, and C. H. Werkman (p. 140) (Iowa Expt. Sta. and Univ. Minn.); The Compatibility of *Spergon* and *Rhizobium leguminosarum* on Pea Seeds, by J. C. Burton and L. W. Erdman (pp. 142-143); The Separation of Some Aerobic Mesophilic Cellulose Bacteria, by W. H. Fuller and A. G. Norman (p. 144) (Iowa Sta.); The Biological Treatment of Lagooned Corn-Canning Wastes, by H. M. Tsuchiya and H. O. Halvorson (pp. 144-145) (Univ. Minn.); and The Synthesis of Riboflavin by Bacteria and Its Role in Symbiosis, by R. P. Tittsler and E. O. Whittier (pp. 151-152) (U. S. D. A.).

Studies on the nutritive requirements of bacteria, D. W. WOOLLEY (*Jour. Bact.*, 42 (1941), No. 2, pp. 155-163).—A general discussion.

The production of gluconic acid and 2-ketogluconic acid from glucose by species of Pseudomonas and Phytomonas, L. B. LOCKWOOD, B. TABENKIN, and G. E. WARD. (U. S. D. A.). (*Jour. Bact.*, 42 (1941), No. 1, pp. 51-61).—Using submerged aerated cultures, 16 strains of 10 species of *Pseudomonas* produced 2-ketogluconic acid, the yield being over 80 percent in many cases. One strain of *P. ovalis* produced only gluconic acid. Of 8 species of *Phytomonas* studied, 4 produced gluconic acid in appreciable amounts, but none produced 2-ketogluconic acid.

Physiological characteristics of lactic acid bacteria near the maximum growth temperature.—I, Growth and acid production. II, Studies on respiration, R. M. STERN and W. C. FRAZIER. (Wis. Expt. Sta.). (*Jour. Bact.*, 42 (1941), No. 4, pp. 479-499, 501-512, figs. 11).

Electrophoresis studies on Brucella, T. W. STEARNS and M. H. ROEPKE. (Minn. Expt. Sta. coop. U. S. D. A.). (*Jour. Bact.*, 42 (1941), No. 3, pp. 411-430, figs. 3).

The bacterial corrosion of iron and steel, T. D. BECKWITH. (Univ. Calif.). (*Jour. Amer. Water Works Assoc.*, 33 (1941), No. 1, pp. 147-165, figs. 5).

A direct smear method for counting microscopic particles in fluid suspension, S.-H. WANG (*Jour. Bact.*, 42 (1941), No. 3, pp. 297-319).—The method is adapted to estimating such particles as cells, parasites, or bacteria.

Bacterial morphology as shown by the electron microscope.—II, The bacterial cell-wall in the genus Bacillus, S. MUDD, K. POLEVITZKY, T. F. ANDERSON, and L. A. CHAMBERS (*Jour. Bact.*, 42 (1941), No. 2, pp. 251-264, figs. 12).—A continuation of the study previously noted (E. S. R., 85, p. 326).

The cytology of bacteria, I. M. LEWIS (*Bact. Rev.*, 5 (1941), No. 3, pp. 181-230).—This comprehensive review (202 references) covers cell inclusions, the nucleus, reproductive structures, cell division, the cell membrane, and flagella.

GENETICS

Transmission tests of maize mutants induced by ultraviolet radiation, G. F. SPRAGUE. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul.* 292 (1941), pp. 385-407, figs. 6).—Various seed and seedling changes induced by treatment (E. S. R., 77, p. 31) with ultraviolet radiation are described briefly. Among 78 inviable types, the mutant type was recovered in F₁ in 71 cases. In several instances the mutant type appeared in low ratios, a tendency most marked in the segregations for "germless" seeds. In male and female transmission tests made with 24 viable mutant types the transmission rates were not significantly different in 15 cases; in the remaining 9 cases the rates were unequal, and in two instances transmission through the male gametophyte was significantly greater than through the female. Several cases of concomitant mutation or derangement, i. e., two or more induced changes in the same gamete, were shown to be separable in F₂ and hence probably of separate origin. The distribution of sperms within the pollen grain and the high absorption of ultraviolet radiation by the pollen grain and its contents appeared to offer a satisfactory explanation for the observed high rate of concomitant derangement. At least some of the induced changes studied, it is concluded, must have been intra-genic in origin.

Inheritance of susceptibility to infection by *Helminthosporium maydis* race 1 in maize, A. J. ULLSTRUP. (U. S. D. A. and Ind. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 6, pp. 331-334, fig. 1).—"The dent corn inbred line *Pr* is unique in its susceptibility to infection by *H. maydis* race 1. All other corn inbred lines and hybrids, including single crosses involving *Pr*, tested in the greenhouse or observed in the field proved to be highly resistant. The susceptibility of the inbred line *Pr* to infection by *H. maydis* race 1 is inherited as a monogenic recessive. The pair of genes concerned have been designated as *Hm hm*."

The pathogenicity of paired haploid lines of *Ustilago zeae* versus the pathogenicity of numerous mixed haploids, M. F. KEENKAMP and W. J. MARTIN. (Minn. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 11, pp. 1051-1053).—When single pairs of monosporidial lines of *U. zeae* were inoculated hypodermically into corn seedlings, the degree of infection induced ranged from slight to very heavy. The degree caused by mass inoculum comprising all haploid lines used in the pairs was intermediate between that due to the least and the most virulent pairs. Like results were obtained when measured amounts of inoculum were used in the single pairs and the composite inoculum contained equal proportions of each haploid line. Individual corn seedlings were also inoculated with weakly virulent pairs of haploid lines and 3 and 6 days later with highly virulent pairs. In no case did the presence of the weakly virulent pair prevent growth of the subsequently introduced highly virulent pair, but the virulence of the latter was reduced. No antagonism was observed between these haploid lines when they were grown in paired combinations on potato-dextrose agar.

The effect of genetical factors, seasonal differences and soil variations upon certain characteristics of upland cotton in the Yazoo-Mississippi Delta, J. W. NEELY. (Coop. U. S. D. A.). (*Mississippi Sta. Tech. Bul.* 28 (1940), pp. 44, fig. 1).—Effects of genetic and environmental factors and their interactions upon 15 characteristics of upland cotton were studied in field tests 1935-38 at Stoneville, Miss. The cottons comprised 24 strains recently developed for commercial planting in the Mississippi Valley and pertaining to the Acala, Ambassador, Delfos, Deltapine, Express, Missdel, Rowden, Stoneville, and Washington varieties.

Differences between strains in regard to each characteristic were found significant. Yield and earliness characteristics were affected much less by genetic factors than were lint percentage, staple length, boll size, percentage of 5-lock bolls, seed index, and lint index. The effect of seasonal influences upon each characteristic was highly significant and predominated over effects of genetic factors and soil variations in regard to 12 characteristics. Staple length, percentage of 5-lock bolls, and seed index were affected more by genetic factors than by seasonal conditions. Soil variations influenced each characteristic, particularly lint percentage, boll size, seed index, and earliness. Effects upon yield characteristics and staple length, although significant, were smaller. Environmental factors that increase lint percentage might not always be desirable, for the initial effect is sometimes one of decreasing weight of the seed and may actually mean a decrease in acre yield of lint. Staple length and seed index are affected more by genetic factors than by environmental factors. The size of boll and percentage of 5-lock bolls are affected by both groups of factors. The lint index and lint percentage are affected to about the same extent by genetic factors, but lint index is affected less by the environmental factors. Strain differences in earliness, while highly significant, were relatively small. Effects of seasons, however, were very pronounced, and soil effects were highly significant.

Inheritance of rust reaction in a cross between the flax varieties Buda and J. W. S., H. H. FLOER. (U. S. D. A. and N. Dak. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 63 (1941), No. 7, pp. 369-388, figs. 3).—Using a cross between Buda and J. W. S., two flax varieties with differential reactions to physiologic races of *Melampsora lini*, it became possible by selecting appropriate races to study in the greenhouse the inheritance of rust reaction to races to which both parents were immune; one parent was immune and the other resistant, semiresistant, moderately susceptible, or susceptible; one parent susceptible and the other moderately so; and both parents susceptible. The reaction of each seedling to 2-5 physiologic races was determined by successive inoculations of the terminal bud with each race at 7- to 8-day intervals and picking off the infected leaves when the rust had developed sufficiently to determine its infection type. F_1 proved immune to all races to which either parent was immune, indicating immunity to be dominant. Susceptible genotypes were identified in the F_2 , but those with intermediate infection types required further tests in F_3 . None of the large number of F_2 and F_3 plants tested proved susceptible to both race 4 (to which Buda was susceptible and J. W. S. immune) and race 7 (to which Buda was immune and J. W. S. susceptible). The results are explained by assuming that immunity in Buda to race 7 is conditioned by a pair of dominant factors allelic to the pair of dominant factors conditioning immunity of J. W. S. to race 4. The reaction of Buda and the segregation of the F_2 population indicated Buda to carry an additional pair of factors conditioning resistance, semiresistance, or moderate susceptibility to specific races that are independent of and hypostatic to the immune factors. On this basis, the genotype of Buda would be I^1I^1RR and that of J. W. S. I^2I^2rr . Both I^1 and R factors appeared to operate in conditioning resistance to races to which Buda was resistant. Reductions in degree of susceptibility to races to which Buda was semiresistant or moderately susceptible appeared to be largely attributable to the R factor. The R factor was incompletely dominant, and plants heterozygous for it were distinctly less resistant than were homozygous plants to races producing intermediate infection types.

A genetic study of common bean mosaic under conditions of natural field transmission, B. L. WADE and C. F. ANDRUS. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 63 (1941), No. 7, pp. 389-395).—In a cross of Stringless Black Valentine \times U. S. No. 5 Refugee and the reciprocal, the results in F_1 - F_3 indicated that the

resistance of U. S. No. 5 Refugee to common bean mosaic virus is dominant to the tolerance of the Stringless Black Valentine, and that a single factor is responsible for the resistance. There were no significant differences between the cross and its reciprocal, but there was a slight but cumulative deficiency of recessives which reached significance in the total populations from segregating families in F_2 .

[Genetic studies by the Vermont Station] (*Vermont Sta. Bul.* 475 (1941), pp. 31-32).—Included in the report are progress statements by G. P. Burns on studies with violets on polyploidy, the significance of chromosome number relations in hybridization, the effect of colchicine treatments, hybridization, and the cytology of pollen grains and pollination processes.

A colchicine induced tetraploid cosmos: Some comparisons with its diploid progenitors, E. H. NEWCOMER. (Mich. Expt. Sta.). (*Jour. Hered.*, 32 (1941), No. 5, pp. 160-164, figs. 2).—An account is presented of a tetraploid cosmos obtained by treating diploid seedlings with colchicine. The new plant was larger in every respect, except height, than its parent, but the increase in size of the various units was not proportional in all instances. In actual cytoplasmic volume of the pollen grains there was little, if any, measurable difference and only a slight increase in chloroplast size of the tetraploid. There was a pronounced increase in the thickness of the tetraploid's pollen cell walls. The most obvious effects of polyploidy were increment in size of flower, petal epidermal cells, stomata, and seeds. Field-grown plants were fully fertile.

A preliminary report on genetic studies on pathogenicity and the nature of saltation in *Venturia inaequalis*, G. W. KETT and M. H. LANGFORD. (Univ. Wis.). (*Phytopathology*, 31 (1941), No. 12, p. 1142).

Oögenesis and fertilization in *Pinus lambertiana* and *P. monophylla*, A. W. HAUPT. (Univ. Calif.). (*Bot. Gaz.*, 102 (1941), No. 3, pp. 482-498, figs. 26).—This investigation of the cytological features associated with the maturation and fertilization of the egg was conducted with two species of pine in which the interval between pollination and fertilization is almost exactly 1 yr. The presence in the mature egg nucleus of a metaplastic substance that is absorbed from the cytoplasm and entirely obscures the chromatin was confirmed. The diploid number of chromosomes, each split longitudinally, was observed at the metaphase of the first embryonal mitosis.

Species hybrids in forest trees, E. C. SMITH and C. NICHOLS, JR. (*Jour. Arnold Arboretum*, 22 (1941), No. 3, pp. 443-454).—Supplementing a review of work in the field of forest tree breeding, such as the use of selected sources of seed, observations on chromosome numbers, the occurrence of natural hybridization, pollination technics, etc., the authors present a list of crosses in the genera *Betula*, *Populus*, and *Ulmus* made at Harvard University in the years 1938 and 1939. In the genus *Populus*, *P. maximowiczii* appeared to be a promising species for use as a female parent.

[Papers dealing with speciation in animals] (In *Biological Symposia*, II, edited by J. CATTELL. Lancaster, Pa.: Jacques Cattell Press, 1941, vol. 2, pp. 1-122, figs. [12]).—Included in this symposium on speciation are articles by L. J. Cole (Univ. Wis.), C. L. Hubbs, L. R. Dice, M. R. Irwin, and R. W. Cumley (Wis. Expt. Sta.), S. Wright, E. Mayr, W. P. Spencer, and T. Dobzhansky. These deal with animals, birds, fishes, and insects.

Animal biology, M. F. GUYER (*New York and London: Harper & Bros.*, [1941], 3. ed., pp. XIX+723, figs. 423).—This general account of the evolution of animal forms and types of systems in animal life brings up to date the book previously noted (*Ill. S. R.*, 78, p. 656).

Progress report on possibilities in progeny-test breeding, H. D. GOODALE (*Science*, 94 (1941), No. 2445, pp. 442-443, fig. 1).—Selection for size in mice has continued through 28 groups, 14 of which have been previously noted (*E. S. R.*, 79, p. 611), and the heaviest ♂s and ♀s at 2 mo. gave respective average weights of 54.3 and 49.7 gm. It is suggested that progeny testing of the kind employed by selection in a desired direction seems to offer unlimited possibilities.

Size inheritance, W. E. CASTLE (Univ. Calif.). (*Amer. Nat.*, 75 (1941), No. 760, pp. 488-498).—Essentially noted previously (*E. S. R.*, 86, p. 28).

The inheritance of equine coat color, [I], II. (Cornell Univ.). (*Jour. Hered.*, 32 (1941), Nos. 7, pp. 235-240; 8, pp. 255-260, fig. 1).—Two studies are presented.

[I]. *The basic colors and patterns*, G. W. Salisbury.—A study of the basic colors of 7,727 Shetland ponies recorded in the American Shetland Studbook showed that, in general, they were inherited in the same manner as in horses. White manes and tails were caused by recessive genes independent of body color. Gray was produced by a dominant gene epistatic to the other colors. Roaning seemed to react somewhat in the same way but did not obscure basic coloring. White spotting and limited white markings were of several types in these ponies and in Finnish and Thoroughbred horses. The presence of a dominant white is noted.

II. *The dilutes, with special reference to the Palomino*, G. W. Salisbury and J. W. Britton.—The Palomino color in horses appears to result from an incompletely dominant dilution gene superimposed on a basic chestnut or sorrel color. When heterozygous dilutes were backcrossed with solid colored ponies there were produced 131 dilutes to 136 nondilutes. The homozygous dilute chestnut or sorrel was almost devoid of hair pigment, had pink skin and china eyes, and had been termed albino.

Significance of haematological studies in horse breeding, H. F. KUSHNER (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 30 (1941), No. 7, pp. 652-654).—The blood value based on hemoglobin content, erythrocyte number, and alkalinity (measured in percentage) was shown to be consistently higher for 2-year-old mares and 3-year-old stallions of the Thoroughbred breed selected for the next year's races than for rejects. Other outstanding performance records of the mares and stallions with high blood values are noted. The hereditary nature of differences in blood composition has been noted by Patrushev (*E. S. R.*, 80, p. 471).

The chromosome complex of domestic sheep (*Ovis aries*), R. O. BERRY (Tex. Expt. Sta.). (*Jour. Hered.*, 32 (1941), No. 8, pp. 261-267, figs. 5).—The chromosome numbers of testicular material from Rambouillet rams showed 54 as the diploid number, with 27 in the metaphase plates of the primary spermatocytes. Six V-shaped chromosomes were observed. A heteromorphic pair was considered evidence of the X and Y chromosomes. When an animal has just attained sexual maturity seemed the best time for making cytological preparations.

Report of a case of true lateral hermaphroditism in *Sus*, P. E. NIELSON (Univ. Wis.). (*Anat. Rec.*, 80 (1941), No. 1, pp. 1-11, pls. 2).—A case of lateral hermaphroditism discovered in the routine inspection of swine at a packing plant is described. There was an ovary on the left side, and a testis on the right. Ovulation had occurred, and a corpus luteum was present. The testis was abdominal and of the cryptorchid type.

The inheritance of paralysed hind legs, scrotal hernia, and atresia ani in pigs, S. BERGE (*Jour. Hered.*, 32 (1941), No. 8, pp. 271-274, figs. 4).—Essentially noted from another source (*E. S. R.*, 85, p. 177).

Wolf-dog genetics, N. A. ILJIN (*Jour. Genet.*, 42 (1941), No. 3, pp. 359-414, pls. 13, figs. 8).—More than 100 of the F_1 , F_2 , F_3 , and F_4 progeny of a zonar-gray, wild-gray wolf ♂ and a black mongrel sheep dog ♀ were examined and showed that the wolf and dog could be readily crossed with segregation for hair and eye color, size, ear form and skull characters, and physiological peculiarities. The many similarities between dogs and wolves suggested the possibility of the origin of the various races of *Canis familiaris* from a single wild species, viz, *C. lupus*.

"Misty," a new coat color dilution in the mouse *Mus musculus*, G. W. WOOLLEY (*Amer. Nat.*, 75 (1941), No. 760, pp. 507-508).—The new coat color was distinct from the multiple allelic albino series and leaden genes since intensely colored individuals were produced in the first generation following this type of crossing. Four types of individuals were produced by backcrossing the F_1 ♀s to dilutes. One of these groups was described as only a slight dilution. This was caused by the recessive gene designated as *m* for misty. Microscopic examination of the hair of *mm* individuals showed the presence of more cortical pigment and less pigment clumping than in *dd* or *lnln* mice. It must be ascertained if *m* is a modifier or the main gene.

The autosexing Ancobar, W. F. LAMOREUX. (Cornell Univ.). (*Jour. Hered.*, 32 (1941), No. 7, pp. 221-226, figs. 3).—Sex dichromatism between birds homozygous and hemizygous for sex-linked barring (*B*) in the presence of the autosomal gene *e'* for mottling made possible the development of the autosexing Ancobar. Of 330 barred and mottled chicks in the F_2 and backcross generations from mating mottled Ancona ♀s with Barred Plymouth Rock ♂s, 93 percent were correctly classified as to sex at hatching. This was possible because of the presence of the two sex-linked barring genes in the ♂s which usually caused a lighter color in the presence of the autosomal mottling gene. Among the chicks with black backs, 98 percent were ♀s, and more than 97 percent of those with light backs were ♂s. The adult plumage in ♀s is barred, but white occurs with only scattered barring in the ♂s.

Hereditary microphthalmia in the domestic fowl, F. P. JEFFREY. (N. J. Expt. Stas.). (*Jour. Hered.*, 32 (1941), No. 9, pp. 310-312, fig. 1).—Hereditary bilateral microphthalmia was recessive to the normal. The gene caused a small eyeball, not visible externally, with thickening of the comb of the chick. Matings of carriers (heterozygotes) produced 106 normals to 60 microphthalmic individuals. Hatching percentages of 25 and 43 of microphthalmic individuals in different years and the helplessness of the chicks at hatching suggested that the condition was a semilethal before hatching and a true lethal after hatching.

Four generations of fowls bred for resistance to neoplasms, F. B. HURT, R. K. COLE, and J. H. BRUCKNER. (Cornell Univ.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 514-526, fig. 1).—By careful selection of breeding stock, mortality from all causes in pullets between 160 and 500 days of age in a line of White Leghorns bred for resistance to disease was reduced from 64 percent in the original unselected populations to 38 percent in the fourth selected generation. Mortality in a line bred for susceptibility to disease was 61 percent in the fourth generation. Selection was based on freedom of families from lymphomatosis and other neoplasms. Only 12 percent died in the resistant strain as contrasted with 26 percent in the susceptible strain in the fourth selected generation. As the resistance to neoplasms increased by selection, increases in body weight, egg production, and egg weight were also attained in the selected line. The observations were based on about 1,000 pullets housed in each of 5 yr. The mean age at death of the pullets in the resistant strain increased for the first 4 yr., although there was some decline in the fifth year.

Because of some question of the reliability of natural exposure, half of the chicks of some 1939 hatches were inoculated intraperitoneally with 0.5 cc. of a suspension of lymphomatous tissue. Mortality from neoplasms in inoculated birds was 23 percent, as compared with 12 percent in naturally exposed birds, but the greater amount was considered due to the heavier dose. Striking differences of from 5 to 30 percent in the mortality from neoplasms in families of 11 sires and differences in purebreds and crosses indicate a genetic basis for resistance to neoplasms. The results show possibilities of breeding for disease resistance.

Note on the sex ratio and mortality in turkeys, V. S. ASMUNDSON. (Univ. Calif.). (*Amer. Nat.*, 75 (1941), No. 759, pp. 389-393).—Among 19,446 poults and turkey embryos, 50.17 percent were ♂s, but the heavier mortality of the ♂s in hatching reduced this to 49.20 percent in hatched poults. During the last week of incubation, more ♂ than ♀ turkey embryos died, but the reverse was found in chickens. Sex-linked genes seemed to have little or no influence on the sex ratio of the turkeys, whereas they perhaps exert an influence on the secondary sex ratio of some strains of chickens, as noted previously by Byerly and Jull (*E. S. R.*, 73, p. 671).

Observations on the embryonic development of turkeys, L. A. WILHELM and E. I. ROBERTSON. (Wash. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 425-427, figs. 2).—Average weights, lengths, and widths of turkey embryos from the fourth to the twenty-fifth day of incubation showed that at from 7 to 22 days the turkey embryo practically doubles its weight in each successive 3-day period. Length and width increases throughout the incubation period were practically linear and furnished a more accurate measure of development than weight.

Histological observations on the formation of the chalaza in the hen's egg, H. M. SCOTT and W. L. HUANG. (Kans. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 402-405, figs. 2).—Histological study of 21 eggs removed from the oviduct at various stages of development first showed chalazal formation in the small end of the egg. It was first detected in eggs removed from the magnum. The chalazas are formed from a suspension of mucin fibers by rotation of the egg, as noted by Conrad and Phillips (*E. S. R.*, 79, p. 526).

High frequency conductivity and dielectric effect of fresh fertile and infertile hens' eggs, A. L. ROMANOFF and K. FRANK. ([N. Y.] Cornell Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 527-530, fig. 1).—Fresh infertile eggs were found to have a higher conductivity and a tendency toward a lower dielectric constant than fertile eggs. The conductivity of the albumen of fertile eggs was 7.4 percent lower than that of infertile eggs. The apparatus and methods for the precise measurements of small differences in the high frequency conductivity and dielectric effect of the intact egg and portions of the contents are described.

Rheological properties of bovine cervical secretions during the oestrous cycle, G. W. SCOTT BLAIR, S. J. FOLLEY, F. M. V. COPPEN, and F. H. MALPRESS (*Nature [London]*, 147 (1941), No. 3728, pp. 453-454, fig. 1).—This brief report from the National Institute for Research in Dairying describes a simple apparatus (oestroscope) which is employed to measure the flow-elasticity of bovine cervical secretions. Based on the established variation in the consistency of the cervical secretion at different stages in the oestrous cycle, this technic has proved useful in the prediction of oestrus in cows.

The influence of oophorectomy on the performance of greyhound bitches, J. QUINLAN and H. P. STEYN (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 15 (1940), No. 1-2, pp. 281-291).—Ovariectomy of 12 greyhound bitches between the

ages of 6 and 12 mo. did not interfere with their racing performance as compared with 6 normal litter mates. Some of the bitches increased in weight, but no cases of heat were noted.

Diminution in ability of the liver to inactivate estrone in vitamin B complex deficiency, M. S. and G. R. BISKIND. (Univ. Calif. et al.). (*Science*, 94 (1941), No. 2446, p. 462).—The inactivation by the liver of oestrone in pellets implanted in the spleen of rats (E. S. R., 86, p. 30) was prevented by vitamin B complex-deficient diets. Within 2 weeks on deficient diets, implanted ♀s previously anoestrous on normal diets developed irregular oestrus and after 3 weeks remained in constant or nearly constant oestrus.

The interrelation of oxidative and glycolytic processes as sources of energy for bull spermatozoa, H. A. LARDY and P. H. PHILLIPS. (Wis. Expt. Sta.). (*Amer. Jour. Physiol.*, 133 (1941), No. 3, pp. 602-609, fig. 1).—In further study of the nature of the intracellular substances other than glucose utilized for energy by bull spermatozoa and the relationship between the oxidative and glycolytic processes (E. S. R., 85, p. 468), spermatozoa separated from semen were able to maintain motility in Ringer phosphate solution only in the presence of O₂. There was practically no motility in a N atmosphere, but with glucose solution added motility was maintained as long as 3 hr. in both air and N atmospheres. Only sugars which spermatozoa could catabolize to lactic acid were effective in maintaining motility. Chemical analyses of semen stored with different sugar solutions showed the phospholipide content of the semen to decrease in proportion to the oxidative utilization of intracellular reserves for motility. Thus phospholipides seem to be the source of reserve energy obtained by oxidative processes from glycolysis of glucose or other glycolyzable sugars.

Problems of artificial insemination in horse and mule production, V. R. BERLINER. (Miss. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 770, pp. 384-388, fig. 1).—Essentially noted previously (E. S. R., 84, p. 463).

Artificial insemination of pigeons and doves, R. D. OWEN. (Wis. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 428-431, figs. 3).—The technic of Quinn and Burrows (E. S. R., 75, p. 326) for obtaining semen and carrying out artificial insemination with fowls has been modified and used with pigeons.

FIELD CROPS

[Agronomic research in the Southern States] (*Assoc. South. Agr. Workers Proc.*, 42 (1941), pp. 35-37, 39-42, 45-47, 48-50, 54-57, 93-100, 101-106, 156-157, 158-160, 161, 196).—Papers of interest to agronomists, presented at the convention of the Association of Southern Agricultural Workers at Atlanta, Ga., February 5-7, 1941, and reported largely in abstract form, included Agronomic Measurements for Evaluating Results of Pasture Experiments, by O. S. Aamodt (pp. 35-36), Production and Harvesting Machinery of Sweet Potatoes for Starch Manufacture, by J. W. Randolph (p. 160), and The Preservation of Sweet Potatoes for Industrial Utilization, by F. H. Thurber (p. 161) (all U. S. D. A.); Do the Amounts of Replaceable Potassium in Alabama Soils Reveal the Need for Potassium When Cotton Is the Crop Grown? by N. J. Volk (pp. 55-56), Difference in Response of Six Different Crops to "Minor" Element and Magnesium Fertilization, by A. L. Sommer and A. Baxter (p. 94), and Nitrogen Losses from Legumes on Three Major Soil Types in Alabama as Revealed by Lysimeter Studies, by R. J. Jones (pp. 105-106) (all Ala. Expt. Sta.); The Pasture Cafeteria as a Means of Evaluating New Pasture Plants, by G. E. Ritchey (pp. 40-41), and Alyce Clover—A New Hay and Pasture Crop for the Southeast, by R. E. Blaser and G. E. Ritchey (p. 99) (both Fla. Sta. and U. S. D. A.); Data on Some Pasture

Research Techniques, by O. E. Sell (pp. 39-40), Soil Acidity and the Available Nutrients in Some Soils of Georgia, by L. C. Olson (p. 93), The Use of Gypsum in Fertilizers for Cotton, by E. D. Matthews (p. 95), and Peanut Fertilizer Studies in Georgia, by U. R. Gore (pp. 103-104) (all Ga. Sta.); Breeding Southern Grasses for Disease Resistance, by G. W. Burton (pp. 49-50) (Ga. Coastal Plain Expt. Sta. and U. S. D. A.); Using Livestock to Measure Results of Pasture Experiment, by W. P. Garrigus (pp. 36-37), and The Amount of Available Nitrogen Under Burley Tobacco and Its Effect on Yield and Quality of the Crop, by P. E. Karraker and C. E. Bortner (pp. 98-99) (both Ky. Sta.); The Response of Southern Grasses and Legumes to Environmental Factors as Expressed by the Chart Quadrat Method of Studying, by J. P. Gray (pp. 99-100), and Breeding Sweet Potatoes for Table Stock and for Starch, by J. C. Miller (pp. 158-159) (both La. State Univ.); Problems Specific to the Production of Sweet Potatoes for the Starch, by W. S. Anderson (pp. 159-160), and Effect of Storage of Treated Cotton Seed in Closely-Woven Cotton Bags, by L. E. Miles (p. 196) (both Miss. Sta.); Some Effects of Fertilization on the Botanical and Chemical Composition of Pastures, by W. W. Woodhouse, Jr. (pp. 41-42), Correlation of Soil and Tissue Tests as an Index of Nutrient Levels for Peanut Production, by E. R. Collins, L. Burkhart, and H. D. Morris (pp. 54-55), The Boron Status of North Carolina Soils and Crops, by J. R. Piland (p. 95), The Effect of Different Cropping and Cultural Treatments on Some Physical Properties of Cecil Soil, by J. F. Lutz (p. 96), Preliminary Results of the Utilization of Corn Belt Inbreds in the N. C. Corn Breeding Program, by P. H. Harvey (pp. 96-97), Agronomic Farm Practices in the Tobacco Belt of North Carolina, by J. F. Lutz (pp. 97-98), Response of Peanut Varieties to Different Fertility Levels, by G. K. Middleton and J. W. Farrior (pp. 101-102), The Improvement of Virginia Type Peanuts by Mass Selection, by J. W. Farrior and G. K. Middleton (p. 102), and Studies in Field Plot Technique for Peanuts, by P. H. Harvey and H. F. Robinson (p. 103) (all N. C. Sta.); Measuring Pastures with Dairy Cattle, by J. P. LaMaster (p. 37), Response of Cotton Grown at Different pH Levels on Cecil Sandy Loam, by W. R. Paden (pp. 93-94), Cotton and Corn Response to Potash in South Carolina, by G. B. Killinger (p. 104), and Problems Specific to the Production of Sweet Potatoes for Commercial Shipment, by O. B. Garrison (pp. 156-157) (all S. C. Sta.); Virginia Pasture Investigations, by A. D. Pratt (pp. 45-47), and Time and Rate of Plant Nutrient Absorption by Bright Tobacco, by A. L. Grizzard and L. Kangas (pp. 56-57) (both Va. Sta.); and Progress in Pasture Improvement Methods, by R. H. Lush (pp. 48-49).

[Farm crops research in Mississippi] (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 9, pp. 1, 2, 7, 8).—Progress results from current agronomic research are reported in articles entitled: Six-Weeks Cowpeas Fruit Well in Old Test and in '41 Holly Springs Test, by E. B. Ferris; Methods Outlined for Harvesting Dallis Grass Seed, by H. W. Bennett; Dolomite Gives Best Returns for Cotton and Vetch, by C. D. Hoover; and Sources, Rate, and Date of Applying Nitrogen to Oats, by R. Kuykendall.

[Field crops and pasture research in New Hampshire] (*New Hampshire Sta. Bul.* 330 (1941), pp. 18, 21-24, 25-26, 28, 38).—Current results are again reported (*E. S. R.*, 83, p. 760) from agronomic research by M. F. Abell, F. S. Prince, P. T. Blood, L. J. Higgins, T. G. Phillips, G. P. Percival, P. N. Scripture, B. G. Sanborn, S. Dunn, and C. L. Calahan, including fertilizer tests with alfalfa on neglected hay lands; a dairy farm rotation with sweet corn as cash crop; rotation and fertilizer tests with potatoes; a fertilizer experiment with clover-timothy hay in the Connecticut Valley; pasture improvement by brush removal and fertilization; a study of pasture grasses and legumes pure and in

mixtures; improvement of timothy and red and white clovers; variety tests with corn and alfalfa; the effects of soil moisture and fertilizer placement on the vitality of the potato seed piece; and poison ivy control.

[Field crops work of the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Bien. Rpt. 1939-40, Span. ed., pp. 64-67, 84-94, 97-104, 105-106, 122-128, figs. 3*).—In addition to results of research with field crops during the biennium noted from other sources (*E. S. R.*, 83, p. 617; 86, p. 34), data are reported by J. P. Rodríguez, P. Richardson, A. Roque, L. A. Serrano, F. Chardón, F. Méndez, C. A. Clavell, E. Molinary Salés, G. Lebedeff, F. J. Juliá, A. R. López, J. H. Axtmayer, J. A. Goyco, and M. C. Fernández, on variety tests of cotton, sugarcane, and soybeans; corn hybrids; fertilizer tests with sugarcane, corn, and cassava; and the comparative forage production of soybeans, pigeon-peas, cowpeas, mung beans, and alfalfa.

Studies in range and pasture botany, W. E. LAWRENCE (*Corvallis, Oreg.: OSC Coop. Assoc., [1940], pp. [184]*).—The general field of range and pasture botany is covered in a number of studies dealing with the range problem, life histories of forage plants, plant regions and groups, grazing areas, plant-soil-grazing relations, and poisonous species. A list of manuals and floras for the United States and Canada, an index to common and scientific names of plants, and a chapter on the preparation of scientific papers are appended.

[Pastures and meadows in Vermont] (*Vermont Sta. Bul. 475 (1941), pp. 21-22*).—Pasture management studies and experiments by A. R. Midgeley on the maintenance of permanent hay lands, both involving zigzag clover and birdsfoot trefoil and other forage species and fertilizer treatments, are reported on briefly.

Grass (*North Dakota Sta. Bul. 300 (1941), pp. 112, figs. 41*).—A memorial to J. H. Shepperd (*E. S. R.*, 80, p. 719), this summation of present knowledge about grass in North Dakota comprises a number of contributions by grassland researchers including the introduction, by W. Whitman (pp. 4-9); sections on Introduced and Cultivated Grasses (pp. 21-31), and Native Grasses (pp. 32-62), both by Whitman and O. A. Stevens; and Characteristics of Grasses (pp. 17-21), Weedy Grasses (pp. 62-65), and Catalog of North Dakota Grasses (pp. 98-107), all by Stevens. Articles prepared in cooperation with the U. S. Department of Agriculture include Value of North Dakota Grasses for Grazing (*E. S. R.*, 81, p. 91), by J. T. Sarvis (pp. 9-16); Grass Culture, by L. Moomaw (pp. 65-76); Processing Grass Seed (*E. S. R.*, 82, p. 181), by G. L. Weber (pp. 76-82); Grass in the Crop Rotation, by J. C. Thysell (pp. 82-88); Diseases of Grasses in North Dakota, by R. Sprague (pp. 88-93); and Grass Breeding and Improvement, by G. A. Rogler (pp. 93-98). An index is appended.

Comparative water usage and depth of rooting of some species of grass, N. L. PARTRIDGE (*Mich. Expt. Sta.*). (*Amer. Soc. Hort. Sci. Proc., 39 (1941), pp. 426-432*).—The water usage by 10 common grasses, May 3 to September 29, and the development and distribution of roots were studied in 3-gal. containers. The grass provided an effective mulching material which reduced greatly the amount of water evaporated directly from the soil surface. Considerable differences were noted in the proportionate distribution of roots in depth as well as in the total weight produced. The use of smooth bromegrass, quackgrass, and reed canary grass did not seem advisable in orchards, since they transpire large quantities of available water and their roots penetrate deeply enough to reach moisture reserves not so likely to be reached by the other species. Redtop, Kentucky bluegrass, and the fescues also transpire considerable available water but do not penetrate so deeply. Timothy and Canada bluegrass seem to offer less competition to trees, but may not always prove most effective for neither is adapted to all soil conditions found in orchards.

The effect of adding vitamin B₁ (thiamin) to several grass species, G. H. AHLGREN. (N. J. Expt. Stas.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 6, pp. 572-576, fig. 1).—Additions of 0.01 mg. per liter of vitamin B₁ had no effect on dry matter accumulation of tops and roots of *Poa pratensis* grown in sand from seed under conditions of either medium or a low nitrate concentration in nutrient media, or of *P. trivialis* and *Agrostis tenuis* grown from cuttings and receiving a nutrient solution containing a medium nitrate concentration.

The distribution of Canada bluegrass and Kentucky bluegrass as related to some ecological factors, J. M. WATKINS, G. W. CONREY, and M. W. EVANS. (U. S. D. A. and Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 9, pp. 726-728).—Observations of soils under two sod types suggested that Kentucky bluegrass inhabited the darker and more friable soil. That the average percentage of organic matter was 2.1 under Kentucky bluegrass and 1.3 under Canada bluegrass was shown by analyses of soil from roadway cuts. The pH values in general were higher under the Kentucky bluegrass sods in pastures. Canada bluegrass was often found growing in dense stands under maple trees along the highway, whereas Kentucky bluegrass dominated away from the trees. On broadcast plats of each species, average yields of plant parts of Kentucky bluegrass slightly exceeded those from Canada bluegrass on a dry weight basis, and its rhizomes penetrated deeper. See also an earlier note by H. B. Hartwig (*E. S. R.*, 80, p. 763).

Seed production of smooth brome grass as influenced by applications of nitrogen, C. M. HARRISON and W. N. CRAWFORD. (Mich. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 643-651, fig. 1).—Smooth brome grass (*Bromus inermis*) planted in 28-in. rows was fertilized with ammonium sulfate at acre rates varying from 100 to 1,000 lb. in three spring months. N applied in April and May of the first seed year (1938) resulted in seed yields greater than the controls, but the same applications in June did not consistently stimulate seed yields. In the second seed year (1939), April applications resulted in marked increases in seed yield, May treatments were not as effective, and June treatments were only slightly better than the control. Lodging was evident with the highest N rates in June 1938, and in April and May 1939. Forage production was stimulated most by the N in May in 1938 and by April applications in 1939. The number of fertile tillers and spikelets per panicle were slightly influenced by N applications, whereas the number of barren tillers and florets per spikelet were significantly increased. The protein content of the forage at seed harvesttime rose consistently with the N rate, June being the most effective date in 1938 and April in 1939.

Pasture investigations.—IX, Ladino clover experiments, 1930 to 1940, B. A. BROWN and R. I. MUNSELL ([Connecticut] Storrs Sta. Bul. 235 (1941), pp. 42).—The results of 11 formal experiments with Ladino clover (*Trifolium repens latum*), concerned in particular with seedings, fertilization, and management, and reported in the ninth contribution in this series (*E. S. R.*, 75, p. 618), proved that it is one of the best legumes for hay and pasture in the region. Experimental yields ranged from about 2,500 to 5,500 lb. of dry matter per acre. It has been less subject to heaving and has yielded more seeded with a grass than when sown alone. Orchard grass was most satisfactory in Ladino mixtures for pasture, and timothy in mixtures chiefly for hay. Inclusion of red clover in orchard grass-Ladino seedings has reduced the prevalence of Ladino and yields of dry matter. Adding Ladino to red clover-timothy mixtures increased the 3-yr. hay yields by about 1 ton per acre. Only 1 or 2 lb. per acre of Ladino seed in mixtures has been enough for good stands.

Ladino has been more tolerant of acid, depleted soils than alfalfa and thrives under conditions suitable for red clover or even where the soil is too wet for that

legume. Indications were that limestone and superphosphate should be used as for red clover seedings. Better stands and larger yields were maintained where generous quantities of K were applied. Growth was not improved by B, Mn, and Cu. Although Ladino clover is also much less sensitive to severe cutting or grazing than alfalfa, it maintained better stands when not cut until 6 or 8 in. high and not closer than 4 in. Close cuttings in October have been harmful, especially to nearly pure stands. Analyses and animal preferences indicated that Ladino has a very high feeding value. Freshly cut Ladino usually contains a higher percentage of moisture than do other legumes.

The effect of rate of planting on yields of adapted and unadapted red clover, E. A. HOLLOWELL and D. HEUSINKVELD. (U. S. D. A. and Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 6, pp. 569-571).—When Ohio (adapted), and western Oregon and French (unadapted) red clovers were seeded at rates of 5, 10, 15, and 20 lb. per acre in systematic replicated plats for yield determinations 1930-33, inclusive, at Holgate, Ohio, increasing the rates from 10 to 20 lb. per acre did not significantly change relative yields of adapted and unadapted seed, although an increase from 10 to 15 and 20 lb. provided more uniform initial stands.

An examination of the accuracy of lattice and lattice square experiments on corn, W. G. COCHRAN (*Iowa Sta. Res. Bul.* 289 (1941), pp. 397-415).—The results of 93 lattice or lattice square designs used in corn varietal tests, 1938-40, were examined for accuracy. For triple lattice designs, three replications averaged somewhat more accurate than five replications of the type of randomized blocks design used previously. Since part of this increase in accuracy might be attributed to the long and narrow shape of replication in the randomized blocks designs, smaller increases would be expected over a randomized blocks design with a more compact replication. For lattice square designs, the increase in accuracy over randomized blocks represents a saving of about one replication in six with 25 varieties, one in five with 49 or 81 varieties, and one in three with 121 varieties. The average standard error per plat of 20 hills ($\frac{1}{200}$ acre) was about 8.5 percent and did not vary markedly among years. The slight increase of standard error with increasing numbers of varieties in a test indicated the value of these designs in providing accurate comparisons for tests with many varieties.

Although many experiments would be needed for a precise comparison, lattice square designs with 4x5 hill plats appeared no more accurate than lattice designs with 2x10 hill plats, as judged by standard errors per plat. Additional evidence in support of this result was obtained on three corn-uniformity trials wherein a lattice square with 2x10 hill plats gave a 15 percent gain in accuracy over either a triple lattice with 2x10 hill plats or a lattice square with 4x5 hill plats. This latter result suggested that lattice square designs may be used profitably in corn experiments with 2x10 hill plats and may also be serviceable for crops, such as small grains and soybeans, where the plat is long and narrow.

The effect of root pruning and the prevention of fruiting on the growth of roots and stalks of maize, J. T. SPENCER. (U. S. D. A. and Ohio Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 6, pp. 481-489, figs. 6).—Effects of root pruning, prevention of fruiting, and their combination upon subsequent growth were studied in 7 inbred lines of corn and 21 possible single crosses among them. Roots of both inbreds and hybrids showed marked reductions in pulling resistance at maturity as a result of pruning, and on the hybrids there were decreased weight of main roots and increased weight of lateral roots. After prevention of fruiting, roots of hybrids increased 48 percent in total dry weight

and 25 percent in pulling resistance compared with untreated plants. The combination treatment likewise resulted in increases in these characters. Responses to treatments consisted largely in increased development of lateral root, averaging for root pruning 28 percent, prevention of fruiting 82, and their combination 130 percent. Root pruning resulted in reductions of 18 percent in grain weight and 14 percent in stover weight, and also reduced the grain-stover ratio of four of the seven groups of hybrids.

The composition of the corn plant grown under field conditions in relation to the soil and its treatment, M. E. WEEKS, E. N. FERGUS, and P. E. KARAKER. (Ky. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 140-146).—Three crops of corn, each consisting of a variety and a hybrid, from the variously treated plats of two fields were analyzed for ash constituents, N, ether extract, and crude fiber. Manure, limestone, and fertilizer treatment affected considerably the amounts of P, Ca, Mg, K, and, to a lesser extent, N in the grain and stover. The P content of the crop varied directly with the amount supplied to the soil. Where limestone was used together with phosphates, the percentage of P in the crop decreased and Ca generally increased in both grain and stover over plats where phosphates alone were used. The Mg content in corn grown on limed soil was generally higher than in that grown on similar soil not limed. K fertilization apparently had no consistent effect on the K content of the grain, yet it increased the amount of K in the stover on the Berea field but not on the Campbellsville field. On the latter field, the amount of K was higher in stover from checks where yields were low than in that from higher-yielding treated plats. N tended to be higher in grain on plats receiving both limestone and phosphate than from other treatments. Fat and fiber did not seem to be affected consistently by treatments.

Relative growth rate of the main stem of the cotton plant and its relationship to yield, N. I. HANCOCK. (Tenn. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 590-602, figs. 3).—Plants of upland cotton varieties grown under field conditions at Knoxville, Tenn., were studied, 1931-38. Plant height was found to be associated closely with the potential as well as the actual crop of bolls. Measurement of 4,879 plants during 3 yr. revealed that from 70 to 80 percent of bolls were in the vertical fruiting areas nearest the main stem. Shedding mainly took place horizontally along the fruiting limb. The curve representing growth rate of the plant was sigmoid, confirming results of others. The velocity of the growth curve was found most rapid from July 1 to August 5, and the data were fitted by the exponential equation $H=Ae^{kt}$, when written in the linear form. The variable expressing the velocity of this period was associated with yield.

Relation of maturity in Bliss Triumph potato seed stocks to effectiveness of ethylene chlorohydrin and other treatments, G. R. TOWNSEND (*Florida Sta. Bul.* 362 (1941), pp. 40).—Numerous stocks of Bliss Triumph potatoes of diverse origins, and often differing in maturity and storage periods, were variously treated with ethylene chlorohydrin (40 percent) solution, as whole or cut tubers, principally during the period 1934-40 at the Everglades Substation. A number of seed stocks also received supplemental treatments with standard fungicides. Practical suggestions for the use of the treatment are included, together with a comprehensive review of literature on potato seed stocks covering 43 titles.

The treatment has been valuable for the fall crop, for by hastening sprouting many seed pieces are saved from decay and the crop usually matures early enough to escape frosts. When fall-crop potatoes are used as seed for the spring crop, the treatment is needed to start growth early enough to produce a crop before hot weather prevents tuber setting. Increases in stand and yield

have varied with stocks and seasons but in general have been of importance. The greater productiveness of seed stocks harvested when somewhat immature was demonstrated.

Failure of treatment may result from a dipping solution too weak to stimulate very dormant tubers, or strong enough to injure the seed pieces. Immature stocks could be treated with much stronger solutions than more mature stocks, probably attributable to their ability to generate wound periderm over the cut surfaces. Danger of overtreatment in the fall might be reduced by allowing cut tubers to heal for not more than 24 hr. before treatment, by reducing the strength of the solution, by shortening the storage period after treatment to 16 hr., and by treating late in the day to take advantage of the lower night temperatures. When very dormant stocks must be treated for spring planting, freshly cut sets may be treated with strong solutions and the treatment period prolonged. Use of fungicides on whole tubers or cut sets has not been beneficial in reducing decay. In fact, lime, sulfur, formaldehyde, and the mercury fungicides sometimes have been observed to increase the decay of sets, probably related to the rapidity with which wound periderm can be generated and effects of the chemicals upon generative cells.

Effect of environment on composition of soybean seed, J. L. CARTER. (U. S. D. A.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 125-130).—Soybean varieties grown at the Illinois, Indiana, Iowa, Missouri, and Ohio Experiment Stations, 1936-39, were found to differ significantly in oil and protein content and in I number of the oil. Climatic and soil factors had no significant effects on the relative standing or ranking of the several varieties in oil and protein content. Direct fertilizer application on a soil medium to good in fertility had little effect on the composition of the seed. On an infertile acid soil lime increased protein content and decreased oil content, while phosphates increased the percentage of P in the seed. No noticeable effect on composition of soybean seed resulted from wide differences in fertility levels maintained in an old rotation by manure and fertilizers.

Soybean production in Iowa, E. S. DYAS (*Iowa Sta. Bul. P30, n. ser.* (1941), pp. 33-47, figs. 6).—Practical recommendations regarding soybeans, based on research of this and nearby stations (E. S. R., 81, p. 642), deal with varieties, cultural practices, harvesting for grain and hay, and effects of the crop on soil productivity. Indicated practices include a well-prepared seedbed, with thorough surface tillage before planting, especially where the beans are drilled solid, planting solid with a grain drill 2 bu. per acre, or spacing rows 21-42 in. apart; one to several cultivations; inoculation of seed; the Mukden variety for northern Iowa, Illini in southern Iowa, and Manchu and Dunnfield throughout the State, either for seed or hay; planting the seed crop soon after normal dates for corn; and for hay planting to reach the hay stage in late August or early September and cutting when pods are one-half to three-fourths full, before the lower leaves begin to yellow and drop. In general, the crops should be limited to the more level land not subject to serious erosion.

[Research on sugar beet production and improvement] (*Amer. Soc. Sugar Beet Technol. Proc.*, [2] (1940), pts. 1, pp. 1-84, 85-102, 106-157, figs. 14; 2, pp. 158-198, figs. 3).—Technical papers of interest to agronomists and plant breeders, presented at Denver, Colo., on January 3-6, 1940, and published in part 1 include Some Illustrations of Methods in Plant Breeding, by H. K. Hayes (pp. 1-17) (Minn. Expt. Sta.); Some Modern Advances in the Study of Plant Nutrition, by D. R. Hoagland (pp. 18-26) (Calif. Sta.); Agronomic Problems of the Sugar Beet Industry in Relation to a Research Program, by H. C. Rather (pp. 27-31) (Mich. State Col.); Comparative Yields of Equal Plant Populations of Sugar Beets with Different Spacing Relations (pp. 32-36), and Comparison of Some

Advanced Generations of a Hybrid Strain of Sugar Beet with the Original Third Generation Selection (pp. 149-154), both by G. W. Deming (U. S. D. A. and Colo. Sta.); Post-Thinning Losses and Their Causes, by A. C. Maxson (pp. 37-39); A Study of Sugar Beet Growth at Jerome, Idaho, by D. E. Smith (pp. 39-41); Influence of Planting Date and Cultural Practices on Sugar Beet Seed Production, by B. Tolman (p. 41) (U. S. D. A.); Main Considerations Followed in Developing Commercial Beet Seed Growing in the Salt River Valley of Arizona, by I. M. McDonald, A. A. Mast, and R. C. Wood (pp. 42-46); The Storage of Beets Between the Time of Harvesting and Slicing in Southern Alberta, Canada, by A. E. Palmer (pp. 46-51); A Preliminary Report on the Effect of Temperature and Beet Conditions on Respiration and Loss of Sugar from Beets in Storage, by C. G. Barr, E. M. Mervine, and R. A. Bice (pp. 52-63) (U. S. D. A. and Colo. and Calif. Stas.); Results of Field Trials of Boron and Treated Seed in the Great Lakes Company Territory, by M. W. Sergeant (pp. 63-66); Phosphorus Deficiency Blight of Sugar Beets Often Called Black Heart Blight, by R. A. Jones (pp. 66-68); Applying Fertilizers to Sugar Beets in Ontario, by H. W. Brown (pp. 69-74); The Effect of Soil Structure on Sugar Beet Growth, by R. B. Farnsworth and L. D. Bayer (pp. 74-84) (Ohio State Univ.); Feed Value of Beet Tops, by N. J. Muscavitch (pp. 85-90); Dusting and Spraying for the Control of Blight of the Sugar Beet, by H. C. Young (pp. 90-99) (Ohio Sta.); A Study of Spacing Effects with Two Varieties of Sugar Beets on a High and Low Level of Soil Fertility, by A. W. Skuderna and C. W. Doxtator (pp. 100-102); The Use of Soil Moisture Determinations to Regulate Irrigation Practices in Commercial Beet Fields, by J. E. Coke and H. I. Hechman (pp. 106-108); List of Characters and Gene Symbols Reported for the Species *Beta vulgaris* L. (pp. 109-113), and The Induction of Polyploidy in *Beta vulgaris* L. by Colchicine Treatment (pp. 118-119), both by F. A. Abegg (U. S. D. A.); Indications of Polyploidy in Sugar Beets Induced by Colchicine (pp. 120-121), Nuclear Phenomena in the Pollen Tube of Sugar Beets (pp. 121-122), and Sugar-Beet Pollen Germination in Relation to Environmental Conditions (pp. 133-140), all by E. Artschwager (U. S. D. A.); The Three Dimensional Quasi-Factorial Experiment with Three Groups of Sets for Testing Sugar Beet Breeding Strains, by H. L. Bush (pp. 113-116); Comparison of Quasi-Factorial and Randomized Block Designs for Testing Sugar Beet Varieties, by A. W. Skuderna and C. W. Doxtator (pp. 116-118); A Comparison of Three Methods of Harvesting Sugar Beet Plots, by A. W. Skuderna (pp. 122-127); A Method of Correcting Tonnage of Sugar Beets for Variation in Percent Stand, by H. L. Kohls (pp. 128-132a) (Mich. Sta. and U. S. D. A.); Breeding Methods with Sugar Beets—Greenhouse and Field Technique, by C. W. Doxtator (pp. 141-143); A Study of Sugar Beet Hybrids, by H. W. Dahlberg (pp. 143-144); Performance of Tonnage, Intermediate and Sugar Types in Some Intermountain Districts, by C. E. Cormany and F. F. Lynes (pp. 145-146); Performance of Direct Increases of Pedigreed and Commercial Lots of Sugar Beets, by H. E. Brewbaker (pp. 147-148); and Progress in Genetics—New Methods in Plant Breeding, by G. H. Siegmundfeldt (pp. 155-157).

Papers in part 2 include Research on Sugar Plants and Some Practical Adaptations, by E. W. Brandes (pp. 158-165) (U. S. D. A.); Report on 1939 Tests of U. S. 200 \times 215, by G. H. Coons, D. Stewart, H. W. Bockstahler, J. O. Culbertson, G. W. Deming, J. O. Gaskill, J. G. Lill, and S. B. Nuckols (pp. 165-168); Breeding for Resistance to Leaf Spot and Other Characters, by H. W. Dahlberg, A. C. Maxon, and H. E. Brewbaker (pp. 169-180); Principal Features of the Seed Accession System in Use by the Great Western Sugar Company, by H. E. Brewbaker (pp. 181-184); Studies on Some F₁ Sugar Beet

Hybrids, by F. F. Lynes and C. E. Cormany (pp. 185-190); Further Studies of Sugar-Beet Seed Ball Extracts with Special Reference to the Toxicity of Hydrolyzed Ammonia, by M. Stout and B. Tolman (p. 191) (U. S. D. A.); and Resistance to *Fusarium* Yellows in Sugar Beets, by H. W. Bockstahler (pp. 191-198) (U. S. D. A. et al.).

Boron deficiency relations in sugar beets grown for seed in Oregon, G. L. STOKER and B. TOLMAN. (U. S. D. A. et al.) (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 657-665, figs. 4).—Foliage of sugar beets receiving B remained green through winter, while foliage of B-deficient beets was damaged severely by freezing; and during cold weather root cankers also developed extensively in the roots of such beets. The B-deficiency symptoms largely disappeared during early spring but reappeared during rapid seedstalk elongation. Symptoms on seedstalks were manifested first by dwarfing of the seedstalk accompanied by an unusually dark green foliage and developing inflorescence. This was soon followed by distortion and blackening of the upper part of the central seedstalk and darkening and death of some or all of the lateral floral shoots. Affected plants often recovered partially, and the multiple second-growth shoots formed a witches'-broom type of inflorescence. Fall application of 25-35 lb. of borax prevented development of deficiency symptoms during winter and during the seed production period the next summer.

Preliminary results on delayed harvest of sweetpotatoes for industrial purposes, G. P. HOFFMAN and J. M. LUTZ. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 39 (1941), pp. 303-307).—The quality of the crop and its behavior in storage, 1936-38, showed that in a normal year it may be practicable to harvest sweetpotatoes for immediate manufacture of starch as late as November 20-30, a month later than the usual date near Meridian, Miss. Such late-harvested roots, however, cannot be stored with consistent degree of success because of danger of decay. The results suggested that with too prolonged delay, serious starch loss may occur even though the roots appear sound at harvest.

Root systems of Bright Belt tobacco, L. J. GIER (*Amer. Jour. Bot.*, 27 (1940), No. 9, pp. 780-787, figs. 4).—Root systems of over 700 Yellow Mammoth tobacco plants, ranging from seedlings to mature plants, were studied under field conditions on four soil types in Harnett County, N. C. Root distribution evidently was not correlated with pH or moisture equivalent but seemed to be limited by factors associated with soil texture. The 248 roots (72 percent adventitious) of a mature plant filled the cultivated layer of the A horizon. The total length of a mature root system averaged 260 m., with a maximum of 432. The shoot: root ratio ranged from 4.95:1 to 13.0:1 and averaged 10:1. While these variations were attributed to competition, blue mold, cultural methods, and perhaps other factors, they suggested that the shoot: root ratio is an unreliable index to the nature and efficiency of a root system. The minimum number to be used with safety for ratio studies is about 25 plants, although significance was shown on all dates when more than 15 plants were used.

The level of exchangeable potassium in soils under Burley tobacco in the central bluegrass region and its relation to the growth of the crop. C. E. BORTNER, M. E. WEEKS, and P. E. KARRAKER. (Ky. Expt. Sta.). (*Soil Sci. Soc. Amer. Proc.*, 5 (1940), pp. 269-273).—Burley tobacco on soils adequately supplied with N and P and having less than about 325 lb. of exchangeable K per acre in the plow layer at setting or shortly thereafter usually responded to addition of K fertilizers in studies, 1939-40. K fertilizers did not increase the plant heights markedly, but did increase leaf spread and improve quality. Combined treatment of K and N prevented frenching in fields where it occurred on unfertilized soil. K alone either reduced or prevented frenching, and N alone did

not prevent it but reduced its severity. Where leafspot was causing damage, K-treated rows were either free from injury or only lightly spotted.

Relation of glume strength and other characters to shattering in wheat, O. A. VOGEL. (Wash. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 7, pp. 583-589, figs. 3).—Studies on eight varieties of wheat, ranging from highly resistant to susceptible as to shattering, employed a new device to measure glume strength. The outer glumes of the second spikelet from the tip of the head usually were weaker than those of any other spikelet. The strength of the outer glumes increased progressively down the spike. Except in the tip floret, the second glume tended to be stronger than the first glume of a given spikelet in six varieties and about equal in the other two. The glumes of the tip spikelets were stronger than those of the second and in some varieties were stronger than those of any other spikelet and shattered less. The second floret, however, shattered more easily than the first in almost every spikelet. Other characters favoring shattering include long glumes, lemmas, and awnlets, and lax, nonclavate, erect spikes. Awns of the Kharkof type, by cushioning shocks of colliding heads, tend to reduce shattering losses over those which could occur if such awns were absent.

Control of field bindweed by dry chlorates, E. A. HELGESON (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 1, pp. 7-8).—Good control of bindweed was obtained with 6 lb. of sodium chlorate per square rod applied in November, March, June, and July. Failure of treatment in May and certain of those in June might be attributed to adverse weather. Four-lb. rates in late fall were promising, whereas 2-lb. treatments were too light at all times. Fall applications appear to offer the surest and cheapest means of control.

Pricklypear control on short-grass range in the central Great Plains, E. F. COSTELLO (*U. S. Dept. Agr. Leaflet 210* (1941), pp. [1]+6, figs. 3).—Pricklypear (*Opuntia polyacantha*), a weed cactus (E. S. R., 82, p. 42) increasingly infesting range areas in the central Great Plains in recent years, is described with special reference to its spread and control. In tests in northeastern Colorado, 1936-37, grubbing with a shovel and either piling and leaving the detached plants or hauling them off in trucks was the most effective method for light stands. A road grader pulled by a tractor removed more than 95 percent of the cactus and approached grubbing in efficiency. It was much faster than the hand method, requiring only 20-30 min. per acre, and also left the plants in windrows, facilitating removal from the range. It was particularly useful in heavy stands. Eradication by means of a 15-ft. rail-road iron pulled behind a tractor was the least efficient of the methods tried. On the level ground the rail removed 90 percent or more of the plants but on rough hummocky ground only 40-60 percent. Acre costs approximated \$1-\$3 for grubbing and hauling high infestations; for complete removal with the grader, \$1.82; and raiiling, piling, and hauling, except in heavy stands, from \$1 to \$3.25. The choice of a control method depends upon density of cactus to be removed and available labor and equipment. Proper grazing control and other practices subsequent to treatment are discussed briefly.

HORTICULTURE

[**Horticultural investigations in the Southern States**] (*Assoc. South. Agr. Workers Proc.*, 42 (1941), pp. 157-158, 165-168, 169-173).—Abstracts of the following papers are listed in these proceedings: Pruning and Training of Tomatoes, by L. R. Farish and G. P. Hoffman (pp. 157-158) (Miss. Expt. Sta. and U. S. D. A.); Nitrogen Requirements of Peach Trees in the Sandhills During the Summer, by C. F. Williams (pp. 165-166) (N. C. Sta.);

Recent Research on the Fertilization of Peaches (p. 166) and Recent Developments on Planting, Cultivation, and Cover Crop Practices (pp. 166-167), both by L. E. Scott (S. C. Sta. and U. S. D. A.); Fruit Thinning and Pruning Peaches, by T. E. Ashley (pp. 167-168) (Miss. Sta.); Pecan Seedling Growth Response to Boron, by G. H. Blackmon (pp. 169-170) (Fla. Sta.); Rooting Pecan Stem Tissue by Layering, by A. C. Gossard (pp. 170-171) (U. S. D. A.); Pollen Studies With Plums Representing Certain Species and Interspecific Hybrids, by W. S. Flory, Jr., (pp. 171-172) and Crossing Relations of Some Diploid and Polyploid Species of Roses, by J. C. Ratsek, W. S. Flory, Jr., and S. H. Yarnell (p. 172) (both Tex. Sta.); and The Growth Cycle and the Effect of Planting Stock Size on the Production of Marketable Bulbs and Flowers of Paperwhite Narcissus, by R. D. Dickey (pp. 172-173) (Univ. Fla.).

[Horticultural investigations by the New Hampshire Station] (*New Hampshire Sta. Bul. 330 (1941), pp. 35-38, 39*).—Among the studies discussed by A. F. Yeager, J. R. Hepler, L. P. Latimer, G. P. Percival, W. W. Smith, H. S. Clapp, and W. D. Holley are the use of Elgetol for the control of blooming of apple trees; the breeding of beans, muskmelons, and tomatoes; the use of colchicine in the production of polyploids; boron requirements of fruit and vegetable plants; fruit and vegetable variety tests; the use of hormone sprays on apples and peaches; medicinal herbs; the storage of apples; blueberry improvement and propagation; squash culture; external treatments for stored squash; and the breeding of lilacs.

[Horticultural studies by the University of Puerto Rico] (*Puerto Rico Univ. Sta. Bien. Rpt. 1939-40, Span. ed., pp. 72-78, 106-114, 114-121, 122, figs. 2*).—In addition to reports of studies previously noted (E. S. R., 83, p. 625; 86, p. 42), data are reported by J. Guiscafré Arrillaga, L. A. Gómez, J. S. Simons, L. A. Serrano, A. Riollano, F. J. Juliá, and E. Molinary Salés on seedlings of the avocado; propagation of citrus; fertilizers for grapefruit; fertilizers and shade crops for coffee; nectar from mangoes; and varieties of papaya and pumpkin.

[Horticultural studies by the Vermont Station] (*Vermont Sta. Bul. 475 (1941), pp. 35-38*).—Activities on the following studies are discussed by M. B. Cummings and C. H. Blasberg: The use of naphthaleneacetic acid in preventing premature dropping of McIntosh apples; the effect of fertilizers on bud formation, fruit setting, and growth in the apple; and the effect of potassium fertilizers on the keeping of the apple.

What happened to horticultural plants during the November blizzard, T. J. MANEY. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.], 75 (1940), pp. 197-204, figs. 3*).—An account is presented of the effects of the November 11, 1940, blizzard which caught fruit and ornamental plants in an immature condition and caused very severe losses. Information is given as to the species and varieties injured and the nature and extent of the injury. In the experimental apple orchard at Ames, Jonathan and Sharon on Hibernial and Virginia Crab trunks and roots survived in fine condition. Varieties which withstood the freeze included Oldenburg (Duchess), Wealthy, Whitney, Yellow Transparent, Hawkeye Greening, Norwel, Edgewood, Secor, and Haralson. Recommendations as to the pruning and handling of injured trees is presented.

The influence of vitamin B₁ and other growth-promoting substances on the growth of plants, E. S. HABER and S. W. EDGEcombe. (Iowa State Col.). (*Iowa State Hort. Soc. [Rpt.], 75 (1940), pp. 142-153, figs. 9*).—The treatment of greenhouse lettuce with various materials, including vitamin B₁ applied weekly in a solution of 1:100,000 parts of water, failed to improve yields

above the control. One dust treatment applied to the roots at transplanting was definitely harmful. In the case of cosmos plants growing in compost, B₁ applied in the above manner appeared to increase the size of the plants, but not significantly. The treatment of Marion Market cabbage seedlings with vitamin B₁ solution gave no significant results. In the case of cabbage and cauliflower, the use of a fertilizer starter solution was beneficial as measured in yield, but the B₁ solution applied to the roots before setting had no effect. Some benefit was obtained, in the case of geranium and *Iresine* cuttings rooted in sand, from a proprietary growth-promoting substance, and there was some indication that the adding of vitamin B₁ to the above substance further increased its effectiveness. Vitamin B₁ was ineffective in increasing growth or preventing loss of transplanted bean plants. Severely pot-bound *Cineraria* and *Asparagus sprengeri* plants showed some benefit from vitamin B₁ solutions. Vitamin B₁ had no effect on bentgrass or bluegrass development, and the treatment of bluegrass seeds with sebacic acid was distinctly harmful. Immersion of the roots of young Hibernian and Virginia Crab apple trees in a solution of vitamin B₁, 1:100,000 for 30 min., was of little, if any, benefit, and not equal to the effect of adding peat to the soil at planting time.

Vitamin B₁ treatment of cuttings and seeds, E. S. HABER and E. SWIFT. (Iowa State Col.). (*Iowa State Hort. Soc. [Rpt.]*, 75 (1940), pp. 153-156).—Lantana cuttings rooted in sand in a 65° F. temperature were not benefited by vitamin B₁ treatment. At 50° there was a slightly higher percentage of rooted cuttings. The immersion of lantana cuttings for 24 hr. in a vitamin B₁ solution was definitely harmful, but the same treatment gave slightly beneficial results with another species. The results with the above species and also with snap beans led to the conclusion that watering sand with a vitamin B₁ solution may increase the percentage of rootings when temperatures are too low for the optimum rooting of cuttings. At favorable temperatures B₁ had no effect. Tomatoes and sweet corn did not respond to B₁ at either 50° or 65°. At a concentration of 1:50,000, vitamin B₁ is apparently toxic to seeds soaked therein.

Changes in the carbohydrate and nitrogenous constituents of cuttings as affected by hormone treatment, I, II, B. W. DOAK (*New Zeal. Jour. Sci. and Technol.*, 22 (1941), No. 4B, pp. 192B-198B, figs. 2; pp. 198B-201B).—This paper is presented in two parts, the first of which deals with *Forsythia* cuttings treated for 18 hr. with naphthaleneacetic acid at a strength of 1:30,000 parts of water before placement in sand held at 65° F. Analyses at frequent intervals showed the treated cuttings to accumulate gradually more reducing sugars in the lower inch than did the controls, which had similar treatment except that distilled water was used instead of the hormone solution. The increase in reducing sugars was at the expense of the total sucrose present. There was a very large increase in the amino N and amide N in the treated cuttings. The results indicated that the chief effect of the hormone was to accelerate the rate and intensity of normal changes in cuttings.

Part 2, dealing with *Rhododendron* cuttings treated with β -indolebutyric acid, α -naphthaleneacetic acid, and α -naphthaleneacetic acid plus alloxan, showed that the α -naphthaleneacetic acid was more effective in mobilizing nitrogenous materials, except nonprotein N, in the base of the cuttings than was the β -indolebutyric acid. On the other hand, the β -indolebutyric acid exerted a greater effect on sugars than the α -naphthaleneacetic acid. The alloxan addition increased the effect on the sugars.

Effects of talc dusts containing phytohormone, nutrient salts, and an organic mercurial disinfectant on the rooting of herbaceous cuttings,

N. H. GRACE (*Canad. Jour. Res.*, 19 (1941), No. 5, Sect. C, pp. 177-182).—Cuttings of *Coleus blumei*, varieties of *Chrysanthemum*, and species and varieties of *Iresine*, treated with a series of talc dusts containing naphthylbutyric acid, nutrient salts, and ethyl mercuric bromide, were propagated in sand in the greenhouse. The naphthylbutyric acid treatment increased the number of roots per cutting and when combined with a mixture of nutrient salts increased the fresh root weight of *Coleus* cuttings. Organic mercury treatment increased, up to 5 percent, the number of *Chrysanthemum* cuttings that rooted and increased the number of roots on *Iresine* cuttings. Beneficial effects from talc alone featured the results. Differential reactions to both talc and organic mercury treatments were shown by closely related varieties.

The bordeaux formula in horticultural research, E. P. CHRISTOPHER. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 153-156).—An apparent lack of uniformity in the understanding of any given formula for bordeaux mixture led the author to send questionnaires to a widely distributed group of workers to obtain their interpretation of the significance of a 4-4-50 formula. The answers revealed a surprising lack of agreement in methods of preparation and even in the materials used. Apparently many of the conflicting results reported from the use of bordeaux mixture may be attributed to the use of different materials and combinations in preparing the mixture.

A simple method of making tree injections, W. H. FRIEND. (Tex. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 203-204).—The author describes a method utilizing $\frac{5}{8}$ -in. garden hose for injecting various fungicidal and nutrient materials into trees. Copper sulfate, in a 1-percent water solution, produced the most favorable response in grapefruit trees affected with little leaf. Zinc chloride solutions of the same strength gave the best results with Temple oranges affected with chlorosis. Large trees required injections at several points, and in the case of dry root gum disease deep borings were necessary to reach the diseased heartwood.

Refractive index as an estimate of quality between and within muskmelon fruits, T. M. CURRENCE and R. LARSON. (Minn. Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 611-620, figs. 2).—In studies with 30 muskmelons representing a mixture of types, it was found that hand refractometer readings on the soluble solids content of the juice may be valuable in measuring quality. Taste tests by 19 people on the same melons showed a standard error of 0.93, indicative of the difficulty of grading melons by taste unless the average of a number of opinions is obtained. Ratings by three experienced testers did not approach the mean scores appreciably closer than the ratings of three testers chosen at random.

In another test where 10 melons were cut into sections, taste determinations showed a slight but significant quality difference in favor of the blossom over the stem end. Refractometer readings failed to show statistically significant differences between the sections of the melon, suggesting that quality differences may be determined by factors other than those measured by the refractometer. In the 10 melons there was a positive correlation between fruit weight and quality score as well as between refractometer reading and quality score.

Effect of stage of maturity at time of harvest on germination of sweet corn, C. W. CULPEPPER and H. H. MOON. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 6, pp. 335-343).—Studies of the effect of stage of maturity on the germinating power of the grains of sweet corn indicated that the grains may be made to germinate when they have attained only a fractional part of their full development if they are appropriately dried after being harvested. At early stages of development, in which only a small percentage germination was obtained, the young plants were weak and had the appearance of rye or

some small-seeded grass. Kernels taken from ears harvested at stages of optimum table quality germinated well and when planted grew into normal plants. It was apparent that sweet corn could be harvested when the ears were in prime eating condition and a part of the ear used for physical, chemical, and quality tests and the remainder preserved for seed. With this procedure selections could be made at the stage of maturity when differences were of greatest importance. The procedure was followed for three successive generations, thus enabling a breeder to isolate desirable strains. It is thought that the new procedure would be particularly valuable in the vicinity of Washington, D. C., where the climatic conditions during the ripening of sweet corn are often such as to cause deterioration of the material for planting purposes.

Anatomical and physiological responses of the tomato to varying concentrations of sodium chloride, sodium sulphate, and nutrient solutions, H. E. HAYWARD and E. M. LONG. (U. S. D. A.). (*Bot. Gaz.*, 102 (1941), No. 3, pp. 437-462, figs. 10).—With nutrient cultures at osmotic concentrations of 0.5, 1.5, 3.0, 4.5, and 6.0 atmospheres, the maximum vegetative growth was obtained at 1.5 with a pronounced depression at higher concentrations. In cases where the high osmotic concentrations were obtained by the addition of sodium chloride or sodium sulfate the growth depression at isosmotic concentrations was greater than in base nutrient cultures. Plants in the high sodium sulfate cultures were smaller than those in the corresponding sodium chloride cultures, suggesting an ionic influence in addition to the effect of the total salt concentration. In all series the cells of the mechanical tissues were smaller in caliber and thicker walled in plants grown at high osmotic concentrations. Cambial activity was inhibited by high concentrations of salts in all series. The percentage of dry matter of tops remained essentially constant at all levels of concentration in the sodium chloride series and increased at the high concentrations in the base nutrient and sodium sulfate cultures. Flower bud formation was retarded and probably reduced in plants grown in high sodium chloride solutions, and anthesis was delayed. Osmotic concentration of the sap increased in all series with an increasing concentration of the culture solution.

An inexpensive homemade scale for weighing fruit, R. L. McMUNN. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 205-208, figs. 2).—The construction and operation are described and discussed.

New seedling fruits productions of 1940, H. L. LANTZ. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.]*, 75 (1940), pp. 124-128).—Observations upon the unusual number of seedlings which fruited in 1940 on the station orchards indicated that certain parental varieties and combinations were notably successful in their yield of worth-while seedlings. The progeny of certain apple crosses are briefly discussed with reference to their outstanding characteristics in tree and fruit.

Report of damage to fruit plants by the November, 1940, cold, V. W. KELLEY and R. L. McMUNN. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 74 (1940), pp. 54-65).—Information is presented on the nature and extent of injury caused by the disastrous freeze of November 11, 1940. The apple varieties found most susceptible to trunk injury were Winter Banana, Rome Beauty, York Imperial, and Stayman Winesap. Golden Delicious, Delicious, Grimes Golden, and Jonathan were resistant, and Gano, Ben Davis, and Willowtwig were apparently uninjured.

Influence of soil moisture on photosynthesis, respiration, and transpiration of apple leaves, G. W. SCHNEIDER and N. F. CHILDERS (Ohio Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 565-583, figs. 3).—In a more complete report (*El. S. R.*, 85, p. 53), data obtained in an environment-controlled chamber and in

the field showed a consistent increase in photosynthesis when the moisture in a relatively heavy soil declined below its field capacity. At a temperature of 100° F. the increase in photosynthesis was shorter than at 80°, due probably to the more rapid drying of the soil and the greater transpiration rate at the higher temperature. The first reduction in apparent photosynthesis appeared sooner at the higher than at the lower temperatures. Before wilting was evident there were marked reductions in apparent photosynthesis and transpiration and an increase in respiration. On several occasions fairly high rates of photosynthesis were recorded when the stomata were apparently closed. When the plants showed definite wilting and the soil moisture was approximately at the wilting percentage, there was an 87-percent reduction in both photosynthesis and transpiration. It was not uncommon for wilted apple leaves to absorb from 1 to 10 mg. or more of CO₂ per hour per 100 cm.² of leaf surface. Following the application of water to wilted trees, the leaves attained turgidity usually within 3 to 5 hr., depending on the degree of wilting. Leaves did not recover their original relationships with the controls in photosynthesis and respiration before 2 to 7 days after watering. Transpiration recovered usually about the same time as, or slightly earlier than, photosynthesis. Photosynthetic responses were approximately the same in the field as in the control chamber.

Progress of orchard soil treatment experiments at Iowa State College, B. S. PICKETT. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.]*, 75 (1940), pp. 136-141).—A comparison of four soil-management treatments, begun in 1939 in an orchard of several varieties of apple, top-worked in 1926 on Hibernial and Virginia Crab rootstocks, indicated that mulching with straw plus 5 lb. of sodium nitrate per tree was a promising method of handling the soil. The yields in 1940 for 36 trees were 797, 736, 679, and 662 bu., respectively, for (1) the mulch, (2) loose bluegrass, (3) loose legumes, and (4) cultivation and cover crop. The nitrate application was identical in all cases—5 lb. per tree. Varieties differed in productivity, but this variation was removed by having all the varieties in equal number in each treatment.

Yields of apples on Hibernial and Virginia Crab stocks, T. J. MANEY. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.]*, 75 (1940), pp. 128-131).—Yield records taken over the period 1932-40 on a number of apple varieties, top-worked on Virginia Crab and on Hibernial, showed that in this initial period of production the varieties on Virginia Crab had greatly outyielded the same kinds on Hibernial. On a given stock varieties differed sharply in yield largely because some, such as Hawkeye Greening, were regular in bearing. In a block of Jonathan trees on various stocks, including the conventional French crab, there was observed a notable variation in total yields over the 3 yr., 1938-40. The range was from 1,024 lb. for 10 trees on Dudley roots to 6,175 lb. for trees on 4-7-16, a vigorous open-pollinated seedling of Canada Baldwin.

Pollination experiments with Starking, G. G. BROWN and L. CHILDS. (Oreg. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 142-143).—In pollination experiments with apples in the Hood River Valley, Starking proved to be practically self-unfruitful but set successfully when cross-pollinated with certain other varieties, particularly Blackjon and Blackmack.

Annual bearing of Snow and McIntosh, R. H. ROBERTS (*Wisconsin Sta. Spec. Bul.*, 1941, Sept., pp. [16], figs. 13).—Beginning with a brief discussion of the physiology of the apple tree with respect to growth and fruiting, the author discusses the fruiting habits of Snow and McIntosh apples. In the apple, in general, blossom buds may be formed terminally and laterally on shoots and terminally on spurs. In the Snow variety buds may be formed in all of these positions, but in the McIntosh the blossoms are produced almost altogether on spurs. The McIntosh is annual in bearing for two reasons: (1) A rare production of blos-

soms from terminal or axillary buds on 1-yr. shoots, and (2) the usual heavy early drop of fruit. When successive seasons of short growth occur, no new spurs are formed to continue regular production and a tendency toward biennial fruiting follows. Very heavy open pruning may produce much the same conditions in the McIntosh as are found in biennial varieties, i. e., too few blossoms one year and too many the next. Moderate pruning, on the other hand, is desirable. The McIntosh requires careful attention to fertilization, supplying N just after the trees have fruited heavily and are entering an off year. N should be withheld when the trees are overfull of blossom buds.

Apple thinning experiments, 1940, R. L. McMUNN. (Univ. Ill.). (*Ill. State Hort. Soc. Trans.*, 74 (1940), pp. 347-364).—This article, the fourth in a series (E. S. R., 83, p. 339), discusses the results of experiments in a year of light fruit set, due apparently to cold prior to bloom and also to a scarcity of honeybees. All dates of thinning tended to reduce the total crop, but thinning immediately after the June drop was least harmful in this respect. Old Wealthy trees in a good state of vigor and moderately pruned were able apparently to size up a crop representing about 4-5 percent and young Golden Delicious trees a crop of about 7-8 percent of a snowball bloom. The use of ringing and scoring and other practices designed to affect the set of fruit and the size of apples showed some benefit, but the results led to the general conclusion that these practices are not to be recommended until natural procedures, such as improved care of the orchard and the providing of pollinizers and adequate bees, have failed.

A continuous apple thinning experiment conducted from 1920 to 1939, D. V. FISHER and R. C. PALMER (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 193-195).—In this further report (E. S. R., 78, p. 631) covering a period of 20 yr. of thinning, in which the same trees were handled alike throughout, data are presented to show that in a given variety 9-in. and 6-in. thinning resulted in practically the same total yields as did 3-in. thinning. The results are believed to be due in part to increased bearing area and to increased size of fruits on the heavily thinned trees. The four varieties in the trials differed in their inherent productivity. Heavy thinning is deemed particularly desirable with such varieties as Delicious and Rome Beauty, where large-sized apples are most profitable.

Anti-drop harvest spray demonstrations in Iowa, S. W. EDGECOMBE. (Iowa State Col.). (*Iowa State Hort. Soc. [Rpt.]*, 75 (1940), pp. 156-168, fig. 1).—The application of two proprietary materials designed to delay the dropping of apples just prior to the regular harvesttime gave good results in several commercial orchards, except when the fruit was allowed to remain on the trees too long after spraying. With Jonathan the decrease in drop was sufficient to yield a distinct financial return. Good, but not as definite, results were obtained with Delicious. It is suggested that two sprays are probably needed in years of high temperature and low precipitation. The first spray might be applied 2 weeks before the time of dropping and the second just as dropping begins.

The effect of plant hormone sprays on the dropping of apples, H. C. AITKEN (*Nova Scotia Fruit Growers' Assoc. Ann. Rpt.*, 77 (1940), pp. 120-124, figs. 2).—Naphthaleneacetic acid sprays were found effective in retarding the preharvest drop of Gravenstein apples. By using two sprays it was possible to retain over 50 percent of the crop until the apples were overmature. One spray was sufficient to hold the fruit on the trees for not more than 10 days past the normal harvest date. Favorable results were obtained also with the McIntosh variety.

Magnesium deficiency of apples in the Nelson District, New Zealand, E. B. KIDSON, H. O. ASKEW, and E. CHITTENDEN (*New Zeal. Jour. Sci. and Technol.*,

21 (1940), No. 6A, pp. 305A-318A, figs. 5).—Premature defoliation, identified as a magnesium deficiency, was prevented by the injection of magnesium sulfate into the branches of affected trees. The symptoms varied somewhat with varieties, but the more characteristic features were brown blotching of the leaves, particularly between the veins, followed by defoliation. The leaves at the base of new terminals were the first to drop, leaving a characteristic tuft of leaves at the tip. Leaves of affected trees were low in magnesium and high in potassium, indicating that an unfavorable ratio of these two elements in the soil interfered with the intake of magnesium.

The effect of borax on the storage quality of Jonathan apples, E. CHITTENDEN and R. H. K. THOMSON (*New Zeal. Jour. Sci. and Technol.*, 21 (1940), No. 6A, pp. 352A-356A).—Borax applied to Jonathan apple trees at the rates of 0.5, 1, and 3 lb. per tree caused injury to the fruit harvested in the second year following application. There was less injury than in the first year (E. S. R., 80, p. 344), but the amount of damage was large, especially in the 3-lb. treatment. The boron content of the fruit was higher than in the controls and was in direct ratio to the size of application. No harmful effect was observed on the fruit from trees sprayed with borax at strengths of 0.1, 0.15, and 0.25 percent in combinations with the regular sprays.

A Royal apricot sport of short chilling requirement: Origin and transmission of characteristics to seedlings, W. E. LAMBERTS. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 175-178, figs. 2).—In 1937 crosses were made between a sport of Royal apricot, characterized by a short chilling requirement, and Newcastle. In addition flowers of the sport designated as Early Royal were self-pollinated. Crosses were made between the regular Royal apricot and Newcastle for comparison. Observations on the resulting seedlings showed those of the Early Royal \times Newcastle cross and of the Early Royal selfed to be very early in leafing out and to attain full leaf much sooner than the trees of Royal, Newcastle, or of a cross between these two. The contrast was particularly striking following the very mild winter of 1940. Evidently the Early Royal sport transmitted its low chilling requirement to its progeny as a dominant character. The author points out that this is one of the few cases in which a horticultural sport has transmitted its characters to seedling progeny.

An acquaintance with peach varietal types is essential in peach breeding to secure improved varieties, M. A. BLAKE. (N. J. Expt. Stas.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 144-147).—The author discusses certain types of peaches, such as the Crawford, J. H. Hale, Greensboro, vegetative, etc., and their behavior and value in crossing. When Early Crawford was crossed upon Elberta the progeny were all of the Early Crawford type in both tree and fruit. J. H. Hale is characterized by a relatively small, thickly twigged tree and lacks the productiveness, hardness, and adaptability of Elberta. Greensboro tends to transmit to its seedlings its habit of having many large fruit buds per foot of annual growth. Other Greensboro characters, such as flat cheek and rapid softening of the flesh at the apex and suture, tend also to be dominant in crossing. The vegetative type tends to grow vigorously late in the season and to develop a light set of fruit buds. There are said to be many different types of peaches, depending on the factors employed in classification. A knowledge of these types is considered helpful in the breeding of improved varieties for special regions and uses.

Studies on time of peach thinning from blossoming to maturity, J. H. WEINBERGER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 137-140).—Thinning experiments conducted in Georgia over a 3-yr. period on early-maturing peaches—Early Rose, Early Hiley, and Hiley—showed, in general, that

fruit removal at any stage tended to reduce the total crop at harvest but did increase size of individual peaches. With all three varieties the earlier the thinning, the greater was the percentage of fruits in the larger sizes at harvest. In 1938, early-thinned Early Rose and Hiley trees matured their fruits earlier and a greater proportion of the crop was harvested in the first pickings. In the other experiments this effect was not noted, although there was a tendency for the thinned trees to mature their fruit before the unthinned trees. Thinning at blossomtime is considered hazardous because late frosts may remove too many of the remaining fruits. It is suggested that a light blossom thinning, supplemented by a second thinning 6 weeks later, would be a safer practice. At 6 weeks the pits had not begun to harden and the fruits destined to drop were usually smaller than those that would mature. Thinning at 6 weeks or later required less time than the earlier operations.

Effect of freeze damage on citrus trees and fruit in relation to grove practices, W. W. LAWLESS. (Fla. Expt. Sta.). (*Citrus Indus.*, 22 (1941), No. 8, pp. 3, 6-7, 14-15).—In this second contribution (E. S. R., 84, p. 336), further evidence is presented of the favorable effects of a complete nutritional program on the resistance of citrus trees to low temperature injury. Considerable leaf drop, wood damage, and some fruit damage were observed in the NPK trees following the freeze of November 1940, while very little damage was apparent on trees in the complete nutritional program which included also Mn, Zn, Cu, and Mg.

Seasonal changes in the carotenoid pigments in the juice of Florida oranges, E. V. MILLER and J. R. WINSTON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 219-221).—In the period from September to March the total carotenoid pigments in the juice of Florida-grown Parson Brown and Pineapple oranges increased from 2.21 to 3.59 and from 1.55 to 7.04 mg. per liter, respectively. The Valencia orange pigments increased up to and through March and declined in the next 2 mo. Mandarin oranges, with a deeper flesh color, had a greater quantity of carotenoid pigments. The course of development was similar in the sweet and mandarin types. The highest carotenoid content in the sweet oranges, 8.48 mg. per liter of juice, was recorded in Valencia, and the highest in the mandarin type, 24.52 mg. per liter, in the King.

Avocado production in the United States, H. P. TRAUB, C. S. POMEROY, T. R. ROBINSON, and W. W. ALDRICH (U. S. Dept. Agr. Cir. 620 (1941), pp. 28, figs. 7).—General information is presented with regard to races and varieties, production and imports, pollination requirements, and general cultural considerations in the widely separated regions of the irrigated Southwest (California) and the humid Southeast (Florida). Information is offered also as to possibilities of culture in the lower Rio Grande Valley and elsewhere. Among subjects considered are soil selection and management, propagation, pruning, fertilization, control of insect (by H. Spencer) and fungus pests, and storage of the fruit.

Rooting pecan stem tissue by layering, A. C. GOSSARD. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 213-214, figs. 2).—The author was able to produce roots from pecan stems with considerable success by trench layering the tops of grafted or budded nursery trees and by air layering shoots of older trees in marcot boxes in conjunction with the indolebutyric acid treatment of Romberg and Smith (E. S. R., 82, p. 195). Apparently the best conditions for rooting were brought about by a combination of etiolation, moisture, a rooting medium, and a root-inducing substance.

Nitrogen content of dormant pecan twigs, G. H. BLACKMON. (Fla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 211-212).—Determination of the N content of dormant 1-yr. twigs, taken in January from bearing trees

included in a fertilizer experiment, showed as high or higher percentages of total N in a given variety where either leguminous cover crops were grown or commercial N was applied or where both practices were carried out. Varieties differed somewhat in their response to soil and fertilizer treatments. For example, the N content of Stuart twigs was somewhat lower than that of Frotscher twigs for all treatments.

Boron in pecan nutrition, G. H. BLACKMON. (Fla. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 209-210).—In 1934, Moore seedling pecans planted in soil and in sand contained in glazed earthen pots were supplied each 2 weeks with 1 l. of a nutrient solution with and without 0.5 p. p. m. of B as boric acid. Ferrous sulfate was added weekly to satisfy the iron needs of the plants. Both sand and soil cultures that received B leached less nitrates, indicating that the seedlings given B absorbed more of the nitrate. In addition, the seedlings receiving B appeared to be somewhat more vigorous. Dry-weight readings on the tops and roots showed greater gains for the B-supplied plants in both soil and sand. The percentage of total N was higher in the tops of seedlings grown without B in both sand and soil. The percentages of total N were the same in the roots of the B and non-B plants in sand, but in the soil cultures N content was higher in the roots of plants receiving no B.

Preliminary experiments on pruning and training of one-year seedling tung trees, J. H. PAINTER and R. H. SHARPE. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 38 (1941), pp. 215-218, fig. 1).—Of different types of pruning and training compared in a tung plantation consisting of open-pollinated seedlings from a single tree, the method by which the top 3 in. of the tree was cut off and notches made above the buds which were desired to develop into branches gave promising results. These trees had the most desirable vertical spacing of branches. In a second experiment in which two groups of tung trees which had formed crowns at 60-75 cm. and 90-105 cm., respectively, were headed at 24 and 12 in. before transplanting, it was noted that the trees followed their inherent tendencies, i. e., high-crowned nursery trees tended to form high-crowned orchard trees, and vice versa. It was possible by pruning to make the two groups crown alike. There was some evidence that under favorable conditions tung trees may be transplanted without pruning or with corrective pruning only.

Some effects of supplementary illumination with Mazda lamps on the carbohydrate and nitrogen metabolism of the aster (*Callistephus chinensis* var. *Heart of France*), R. WENGER. (Purdue Univ.). (*Plant Physiol.*, 16 (1941), No. 3, pp. 621-628, figs. 2).—China-aster plants grown in late fall and early winter in a greenhouse with an average temperature of 55° F. responded markedly to light supplied in addition to daylight. The plants without additional light were least vegetative, bloomed the latest, had the fewest blooms, and were high in percentage of carbohydrates and soluble nitrogen but evidently unable to utilize these materials effectively. Plants receiving supplementary light of the lowest intensity, 0.3 footcandles, were earliest to bloom and bore the largest number of flowers. As light intensity was increased to 100 footcandles, vegetative activity increased and the percentage of carbohydrates and soluble nitrogen decreased in the early stages of growth. When the plants reached the flowering stage, composition was very similar in all lots irrespective of light treatment.

FORESTRY

[Forestry studies by the New Hampshire Station] (*New Hampshire Sta. Bul.* 330 (1941), pp. 31-32).—Included are reports on studies by C. L. Stevens

and L. C. Swain of native and introduced forest species, native nut species, selection in the white pine, and the silvicultural requirements of the spruce.

[Forestry studies by the Vermont Station] (*Vermont Sta. Bul.* 475 (1941), pp. 29-31).—Included are brief reports by G. P. Burns on the following studies: Light requirements of forest species, the effect of spacing on the growth of red and white pine, effect of density of white pine stands on soil temperature, and effect of thinning on reproduction in Vermont forests.

Forestry in Mexico, H. A. MEYER (*Chron. Bot.*, 6 (1941), No. 17-18, pp. 395-399, fig. 1).—Information is given on the history of the Mexican forestry movement; area, distribution, and types of forests; forest legislation and organization of the forest service; and the accomplishments and future problems of Mexican forestry.

Climax forests of the Upper Peninsula of Michigan, S. A. GRAHAM. (Univ. Mich.). (*Ecology*, 22 (1941), No. 4, pp. 355-362, figs. 6).—Of trees present in the mixed hardwood-hemlock forests of the Upper Peninsula, only four species, namely, hemlock, sugar maple, basswood, and balsam fir, possess the adequate tolerance and capacity for reproduction on a deep layer of duff and leaf litter to meet the essential requirements of climax species. Attempted reconstruction of the forests as they were some fifty years ago before lumbering operations began indicated the probable occurrence of a devastating fire four or five centuries ago, followed by a succession of (1) aspen, (2) pine, yellow birch, hemlock, and sugar maple, and (3) a decrease of the birch and an increase in hemlock and sugar maple. The pines would have probably disappeared, even without lumbering, leaving a hypothetical climax forest of hemlock, sugar maple, and basswood. The disturbing factors in the development of a forest succession are fire, wind injury, insects, and fungi.

Polyembryony in seeds of southern pines, M. L. NELSON (*Jour. Forestry*, 39 (1941), No. 11, pp. 959-960).—A number of instances of more than one embryo per seed was noted in the 1936-37 season, especially in *Pinus palustris*. Polyembryony was most often characterized by two seedlings, one large and one rather small and usually imperfect. Occasionally the two seedlings were equal in size, and apparently both were capable of normal development. In a few cases three or more seedlings were recorded. Polyembryony appeared more often in some lots of seed than in others of a given species, even though all were collected in a single season.

Fertilizer trials for improved establishment of shortleaf pine, white ash, and yellowpoplar plantings on adverse sites, W. H. CUMMINGS (*Jour. Forestry*, 39 (1941), No. 11, pp. 942-946).—The application of different formulas of NPK fertilizer with acid peat or dolomitic limestone in the mattock holes before setting young shortleaf pine, white ash, and tuliptree (yellow poplar) seedlings resulted in no marked superiority with respect to height increment of fertilized over untreated trees. There was, however, evidence of favorable and of harmful influences of various concentrations of the three major fertilizer elements. The supplemental material, dolomitic limestone or acid peat, may introduce considerable differences in fertilizer response. P was beneficial at the highest level in the fertilizers with peat supplements. K was harmful at the highest level when used with dolomitic limestone. For white ash, N at high levels was beneficial and both P and K at high levels were deleterious. There were no significant effects of N, P, or K on the tuliptree.

Effects of certain soil treatments on the development of loblolly pine nursery stock, L. K. ANDREWS (*Jour. Forestry*, 39 (1941), No. 11, pp. 918-921).—Of several fertilizer and soil treatments applied to a Norfolk sand prior to setting loblolly pine, those which included organic material, such as peat, with a

concentrated fertilizer containing a high percentage of P resulted in the most desirable planting stock. Concentrated fertilizers with a high percentage of P tended to increase root:shoot ratios, but it was evident that rapid leaching of soluble material occurs, suggesting applications a few weeks after germination of seeds. The inclusion of organic materials in the sandy soil tended to favor the development of small branching roots.

DISEASES OF PLANTS

Manuale di patologia vegetale [Manual of plant diseases], R. CIFERRI (*Città di Castello, Italy: Tipog. Casa Editrice S. Lapi, 1941, pp. XXIII+730, figs. 256*).—Included are maladies and abnormalities of nonparasitic origin and diseases caused by viruses, bacteria, fungi, and phanerogamic parasites.

The Plant Disease Reporter, [October 1 and 15 and November 1 and 15, 1941] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 25 (1941), Nos. 18, pp. 451-469; 19, pp. 469-493, pl. 1, figs. 4; 20, pp. 494-521, figs. 2; 21, pp. 522-538, figs. 3*).—In addition to the host-parasite check-list revision, by F. Weiss (No. 18 *Phoradendron* to *Picea*, 19 *Picramnia* to *Pinus*, and 20-21 *Pinus* continued), the following items are noted:

No. 18.—Transmission of western X-disease and marginal leaf spot of peach in Oregon, by S. M. Zeller and A. W. Evans; a plea for the nematode survey, by G. H. Godfrey; a Root Knot Garden Poll sponsored by the Plant Nematode Council, by H. P. Barss; notes on vegetable diseases in Oregon, by F. P. McWhorter and C. E. Owens; and brief notes on unusual incidence of some bean diseases in Idaho, watermelon diseases in Nacogdoches Coun'y, Tex., bleeding necrosis of sweet gum, *Ascochyta* on sorghum in Mississippi, and flax rust prevention by borax.

No. 19.—Thrips injury of peanut seedlings, by G. M. Shear and L. I. Miller, noted on page 357; virus diseases of peach in western Colorado (X-disease or yellow-red virosis and golden-net virus disease), by E. W. Bodine and L. W. Durrell; association of Pierce's disease of grapevines and alfalfa dwarf in California, by W. B. Hewitt and B. R. Houston; field tests with a staminate clone of alpine currant immune from blister rust under greenhouse conditions, by G. G. Hahn; blighted barley in Nebraska, by M. W. Felton; oversummering of oats stem rust on orchard grass in Arkansas, by H. R. Rosen; incidence of ear rots in the 1940 corn crop, by N. E. Stevens; plant diseases in Colorado in 1941, by E. W. Bodine and L. W. Durrell; and brief notes on *Helminthosporium* leaf spot on millet in New Jersey, and southern wilt on lilies in Oregon.

No. 20.—A wilt and root rot of asparagus caused by *Fusarium oxysporum* Schlecht, by S. I. Cohen and F. D. Heald; bacterial ring rot of potatoes in Illinois, by H. H. Thornberry; root knot nematode in parts of west Tennessee, by J. M. Epps and L. A. Fister; gray spot (*Stemphylium solani*) of tomatoes in Texas, by A. L. Harrison; strawberry diseases in Oregon in 1941, by S. M. Zeller; some diseases of belladonna in California and their control, by J. T. Middleton; tobacco diseases in Massachusetts in 1941, by O. C. Boyd; and a survey of cotton boll rot diseases and associated micro-organisms in 1941, by P. R. Miller and R. Weindling.

No. 21.—Tobacco black shank (*Phytophthora parasitica*) is spreading in Virginia, by S. B. Fenne.

Bureau of plant pathology, D. G. MILBRATH (*Calif. Dept. Agr. Bul., 29 (1940), No. 4, pp. 268-282*).—Progress reports are given on work of the department regarding peach mosaic eradication, western celery mosaic, chestnut blight, Pierce's disease of grapes, potato diseases (bacterial ring rot and viruses), pear blight, *Pittosporum* virus diseases, the southern root rot fungus (*Sclerotium*

rolfsii), cantaloup powdery mildew, watermelon mosaic, white pine blister rust, bulb treatment for root knot nematode, root knot in nursery trees, and vesicular exanthema of hogs in relation to virus diseases of plants.

[Plant disease work by the New Hampshire Station] (*New Hampshire Sta. Bul.* 330 (1941), pp. 28-30).—Brief reports, by O. Butler, S. Dunn, and L. P. Latimer, are included on the causes of injury to beans by lime-sulfur sprays; effects of mulching on development of bitter pit in apple fruits; effects of place on mosaic and leaf roll of potato; relative resistance of peony varieties to blight; and spraying for apple scab.

[Plant disease work by the Vermont Station] (*Vermont Sta. Bul.* 475 (1941), pp. 34-35, 38).—Brief reports by M. B. Cummings and C. H. Blasberg of current work are included on spraying for apple scab control, potato scab studies, and comparisons of chloroplasts from healthy and mosaicked plants.

Plant pathology (*Philippine Bur. Plant Indus. Semiann. Rpt.*, Jan. 1-June 30, 1939, pp. 73-78).—Reports of progress are included on diseases encountered, diseases of Manila hemp (abacá) and of rice and other cereals, coconut "cadang-cadang" and associated fungi, and legume nodule bacteria (particularly of soybeans).

Quantitative studies on the serological reactions of some plant viruses and of a pea nodule bacterium (*Rhizobium leguminosarum*), A. KLECZKOWSKI (*Brit. Jour. Expt. Pathol.*, 22 (1941), No. 1, pp. 44-58, figs. 3).—Studying tobacco mosaic, aucuba mosaic, and bushy stunt viruses and a strain of pea nodule bacteria, the antibody: antigen ratios in the precipitate formed at equivalence point by these viruses with their homologous antisera were intermediate between ratios for bacterial agglutination and for precipitation of smaller antigens like ovalbumin or blood serum proteins. An aucuba mosaic virus antiserum contained antibodies reacting with aucuba mosaic virus but not with tobacco mosaic virus, in addition to antibodies reacting with both, whereas all antibodies in a tobacco mosaic virus antiserum reacted with both viruses. With the same amount of antibody, maximum precipitate with the rod-shaped tobacco mosaic and aucuba mosaic viruses was much greater than with the spherical (or almost so) bushy stunt virus, and was formed in much greater antigen excess. Qualitative differences between strong and weak tobacco mosaic virus antisera were found.

Virus antagonism, natural host resistance, and the acquired-immunity concept with reference to plants, H. H. MCKINNEY. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 11, pp. 1059-1061).—The so-called acquired immunity in mosaics may be regarded as a type of virus antagonism or selective antibiosis. Tobacco ring spot studies indicated that affected plants do not out-grow the disease, but merely pass from an acute to a chronic phase, or the acute phase continues throughout the life of the plant when succulent growing leaves are wiped with a large amount of virus after the plants have entered the maximum growth-rate period. For the most part, tobacco varieties apparently do not possess a very high degree of susceptibility to ring spot, and it appears that a complete understanding of the disease depends in large measure on a knowledge of the several factors influencing the expression of natural host resistance. It is urged that the term "acquired immunity" be reserved for those cases in which there is no multiplication of an infective agent, as it is believed that carriers manifest at least microscopic and biochemical disorder.

The *Aspergillus glaucus* group, C. THOM and K. B. RAPEL (*U. S. Dept. Agr., Misc. Pub.* 426 (1941), pp. 46, figs. 14).—This group comprises an omnipresent and nearly omnivorous aggregation of fungi showing green heads and yellow perithecia on diverse substrata. A large number of strains have been studied,

including cultures isolated by the authors over a 35-yr. period and those contributed by the great culture collections of the world, many of the latter bearing the specific names under which those strains appeared in the literature. Comparative culture under a wide range of conditions has brought together the strains studied into a series of aggregate species, each characterized by ascospores of a particular size range and with typical markings. Those recognized are *A. repens*, *A. ruber*, *A. chevalieri*, *A. amstelodami*, *A. minor*, *A. umbrosus*, *A. echinulatus*, *A. medius*, *A. carnyi*, and *A. niveo-glaucus* n. sp. Within these aggregates, for each of which a type is described, the additional species and varieties recognized are *A. pseudoglaucus*, *A. chevalieri intermedius* n. var., and *A. monteridensis*. The usages represented by strains received under particular names in culture are tabulated to show their place in the proposed arrangement of species. Based on variation studies, forms with the ascospores of a particular series but differing in colony morphology and details of activity are regarded as variants rather than taxonomic varieties.

Experimental consideration of the mold toxins of *Gliocladium* and *Trichoderma*, R. WEINDLING (*Phytopathology*, 31 (1941), No. 11, pp. 991-1003, fig. 1).—Potent filtrates active against *Rhizoctonia solani* were secured from *G. fimbriatum* and from certain *Trichoderma* isolates but not from others. The toxins were extracted by lipid solvents, and most effectively by chloroform. The crystalline toxin of *Gliocladium* (gliotoxin) was formed during the logarithmic growth phase. Shaking the cultures gave good yields of gliotoxin in highly acid glucose- or sucrose-containing media. Ammonium salts proved to be better N sources than peptone or nitrates. Mycelium and toxin production showed no correlation. Gliotoxin was more toxic to spores of *Sclerotinia americana* and hyphae of *R. solani* than CuSO_4 and less so than HgCl_2 , but it was harmless to *Gliocladium* spores. Gliotoxin solutions were stable below pH 7.0 at room temperature, but above pH 7.0 the decomposition rate increased with rise in pH. Solutions at pH 2.4 resisted autoclaving at 16 lb. for 30 min. Thermostability decreased rapidly with decrease in acidity. The magnitude and rate of toxic effects increased with rises in temperature. Tested at various pH levels, the maximum activity occurred at pH 8.2, and at pH 9.5 toxicity was immediately lost.

Comparative physiology of crown gall, attenuated crown gall, radiobacter, and hairy root bacteria, A. J. RIKER, M. M. LYNEIS, and S. B. LOCKE. (Wis. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 11, pp. 964-977, figs. 5).—The physiological reactions of the cell-stimulating bacteria, *Phytomonas tumefaciens* (virulent and attenuated), *P. rhizogenes*, and *Bacillus* (= *Alcaligenes*) *radiobacter* were compared. The virulent and attenuated crown gall bacteria were carried below 28°-30° C. where galls develop well on tomato, and above this temperature where galls fail to develop. The hairy root bacteria differed from the others by producing acid from sugar and by failing to initiate growth on inorganic N. Otherwise, all these bacteria proved similar in their utilization of various N and C sources and in their production of CO_2 and H_2S . The virulent and attenuated crown gall cultures appeared quite similar in agglutination tests, in producing minor fluctuations in the osmotic pressure of various media, and in their multiplication in host tissues. No galls developed on tomato, *Sedum*, or *Bryophyllum* above 28°-30°, but galls were produced above these temperatures on several kinds of tobacco. The crown gall bacteria appear to be pathogenic independently of the physiological characters studied.

Growth substance in crown gall as related to time after inoculation, critical temperature, and diffusion, A. J. RIKER, B. HENRY, and B. M. DUGGAE. (Wis. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 7, pp. 395-405).—

Using growth substances of the heteroauxin group, no significant differences in auxin content were found between inoculated and control tissue 1, 4, 8, and 16 days after inoculation, especially when comparisons were made on a total N basis. Galls and control stems from decapitated tomatoes contained about half as much auxin as those from whole plants, but the gall sizes were similar in both cases. No significant difference was found between the auxin content of tomato stems grown at 27° C., where galls developed, and at 31°, where they did not; neither were there significant differences in the amount of auxin diffusing from stems bearing galls and from control stems.

The experiments of certain other investigators, from which suggestions or claims have been made that substances like heteroauxin were responsible for the pathogenicity of crown gall bacteria, have been repeated, but although their results have been generally confirmed, their conclusions appear unjustified. So far as the authors are aware, the crown gall bacteria are pathogenic independently of auxin production.

The role of certain vitamins and metallic elements in the nutrition of the crown-gall organism, F. C. MCINTIRE, A. J. RIKER, and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Bact.*, 42 (1941), No. 1, pp. 1-13, fig. 1).—*Phytomonas tumefaciens* grew very well in a simple synthetic medium containing Fe, Mn, and Zn, which are shown to be important in its nutrition. Growth in this medium was increased only moderately by addition of yeast extract. The evidence presented indicates that stimulation by the organic material in yeast extract may be attributed to thiamin, riboflavin, pantothenic acid, and amino acids. The organism synthesized large amounts of biotin and riboflavin, moderate amounts of thiamin and pantothenic acid, and apparently sufficient amounts of any other such factors as are necessary for growth in the synthetic medium. This character needs consideration in relation to the cell-stimulating capacity of these bacteria. Supplementing the synthetic medium with Mn increased the rate of sugar fermentation and the percentage of fermented sugar converted into gums and cells, but less sugar was accounted for as unidentified products.

Effect of fertilizer materials and soil amendments on development of apothecia of *Sclerotinia fructicola*, K. BAUR and G. A. HUBER. (West. Wash. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 11, pp. 1023-1030, figs. 3).—"The effects of surface applications of hydrated and carbonated lime and of fertilizer salts to the soil under trees, in both dry form and aqueous solutions, on the development of apothecia are here reported. Aqueous solutions of three fertilizer salts proved ineffective; of the dry materials used, only calcium cyanamide prevented the development of apothecia. Calcium cyanamide remained toxic longer when the soils remained relatively dry after application than when the material was exposed to heavy rainfall. By delaying applications until just prior to apothecial emergence, the material remained toxic sufficiently long to prevent development of apothecia. No toxic effects were observed on trees in plats treated with calcium cyanamide. The duster described in this paper was especially designed for the application of calcium cyanamide."

Saltants from a monospore culture of *Verticillium albo-atrum*, J. T. PRESLEY. (Minn. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 12, pp. 1135-1139, figs. 2).—In an effort to induce rapid sectoring, a single-spore culture of *V. albo-atrum* was grown on various media, the one on which sectors appeared to be produced in greatest abundance being made up of MgSO₄ 0.5 gm., KH₂PO₄ 1.5, NH₄NO₃ 0.05, KNO₃ 2, asparagine 1.5, dextrose 20, and agar 20 gm., and distilled water 1,000 cc. By selective picking of the sectors, cultures were obtained differing widely among themselves and remaining rather constant in appearance throughout repeated transfers. The cultures varied from pure white (mycelial) to grayish

black (microsclerotial) and from aerial to completely appressed. Grown together in Petri dishes, some of the sectors exhibited distinct mutual antagonism. Because of the wide range of cultural characters shown by the various sectors from a single-spore culture a possible bearing on the taxonomy of species in the genus *Verticillium* is suggested.

Defense mechanisms in plants and animals (In *Biological Symposia*, II, edited by J. CATTELL. Lancaster, Pa.: Jaques Cattell Press, 1941, vol. 2, pp. 123-163, fig. 1).—Included are: Local Reactions in Plants, by F. W. Went (pp. 123-132); Generalized Defense Reactions in Plants, by W. C. Price (pp. 133-144); and Local and Generalized Defense Reactions in Animals, by W. Bloom (pp. 145-163).

Seed-borne organisms and plant quarantines, R. H. PORTER (*Jour. Econ. Ent.*, 34 (1941), No. 4, pp. 549-548).—The author considers the interrelations of seed-, bulb-, corm-, and tuber-borne organisms and plant quarantines as to the extent disease-producing entities are thus carried, methods of detecting them, and the possibility and practicability of establishing proper facilities for the assistance of officials who might be required to regulate the seed commerce.

An analysis of factors causing variation in spore germination tests of fungicides.—III, Slope of toxicity curves, replicate tests, and fungi, S. E. A. MCCALLAN, R. H. WELLMAN, and F. WILCOXON (*Contrib. Boyce Thompson Inst.*, 12 (1941), No. 1, pp. 49-77, figs. 7).—In a further analysis (E. S. R., 84, p. 202) of the factors causing variation in spore germination tests, 718 toxicity curves were studied, including 20 compounds, on *Sclerotinia fructicola*, *Glomerella cingulata*, *Alternaria solani*, *Macrosporium sarcinaeforme*, *Botrytis* sp., and *Rhizopus nigricans*. Four types of slopes were observed on logarithmic probability paper, viz, simple straight line, double slope with left-hand "break" in lower values giving a curve concave upward, double slope with right-hand break in upper values giving a curve convex upward, and triple slope (sigmoid curve). The last two types comprised 17 percent of the curves. The type and steepness of curve was determined more by the compound than the fungus. Heterogeneous compounds differing widely in slope, as well as compounds of convex and sigmoid type curves, should be evaluated at high LD levels. Highly significant correlations were obtained between steepness of slope and toxicity at the LD50 point for straight and concave type compounds of the heavy metal and Cu series. No correlation was observed among the organic compounds. These studies indicated the value of the rapid graphic method for general comparisons. Tests replicated the same day with the same lot of spores in general varied no more than expected from their internal error, which was not true for different times and spore lots. There was a linear relation between the logarithms of LD50 and of the number of spores exposed to the fungicide. Errors in adjusting the concentration of a spore suspension will account for only a small portion of the variance in replicated tests. Different fungicides may be rated approximately in terms of a standard, but its most effective use to adjust day-to-day variations is limited to compounds of essentially similar slope and composition. Five of the fungi were essentially alike in average sensitivity, only *Rhizopus* being significantly more sensitive. Sensitivity was not inversely proportional to spore volume. In many cases the fungi were unlike in sensitivity to specific compounds and would thus rate them differently. Such fungi (e. g., *A. solani* and *S. fructicola*) can be efficiently used in laboratory testing. Selection of fungi for laboratory tests should be based on reproducibility of results, ease of counting, and ready production of spores in quantity. Experimental designs to give maximum efficiency of test and evaluation results are outlined.

The spore-germination method of evaluating fungicides, P. D. PETERSON. (Del. Expt. Sta. et al.). (*Phytopathology*, 31 (1941), No. 12, pp. 1108-1116,

fig. 1).—A modified procedure is outlined whereby practical standardization and stabilization of drops of water can be attained by gluing 12-mm. glass circles to the microscope slides with petrolatum, where they serve as standard surfaces onto which measured amounts of fungicides and spores are pipetted either separately or in combination. By this procedure a single 75-by-25-mm. slide can be made to carry as many as 10 treatments. A hanging-drop method of applying the fungicide is also described. Conidia of *Sclerotinia fructicola* from peach failed to germinate satisfactorily in distilled water when so removed from a sporulating surface as to avoid contamination with nutrients from culture media. Of the several nutrients tested, including dextrose, prune-agar extract, and potato-dextrose-agar extract, the last proved most highly stimulatory to the conidia. A nutrient solution made by extracting 0.1 gm. of Difco potato-dextrose-agar powder with 100 cc. of water produced a high-percentage germination. An experiment is outlined whereby each lot of the dry powder can be assayed as to stimulatory dosage.

The influence of lithium salts on certain cultivated plants and their parasitic diseases, N. L. KENT (*Ann. Appl. Biol.*, 28 (1941), No. 3, pp. 189–209, figs. 3).—At concentrations of 1–4 milligram equivalents of Li per liter of soil, LiCl and LiNO₃ reduced the amount of *Septoria apii* leaf spot on celery and increased the weight of the plants. Larger amounts gave better control but injured the host. The Li content of plants was increased by soil applications, and the higher the amount in the leaves the lower was the infection. Applications of the Li salts to wheat seedlings reduced their susceptibility to *Erysiphe graminis* powdery mildew, in small doses stimulated and in large doses retarded growth of the host, and at all concentrations tested increased the Li content of the aerial parts. The higher the Li concentration in both soil and host the less intense was the mildew infection. The susceptibility of wheat seedlings to *Puccinia triticina* leaf rust was reduced by adding LiCl to the soil at the rate of 18 m. e. per liter of soil, but the plants were distinctly injured. Smaller concentrations failed to control. The diameter and weight of tomato galls due to *Phytomonas tumefaciens* were reduced by LiNO₃ applied at the rate of 25 m. e. per liter of soil, and the fresh weight of plants treated with LiCl was increased. The effect of LiNO₃ on the yields was negligible. There was a close relation between the Li concentration in the galls and that applied, and the higher the concentration the lower was the gall weight. Excretion of Li from the treated tomato plants was increased by the high concentration in the leaves and by premature leaf fall. The nature of the effects on susceptibility, and the stimulatory and toxic effects, are discussed. There are 63 references.

Boron—a minor plant nutrient of major importance, W. L. POWERS. (Oreg. State Col.). (*Better Crops With Plant Food*, 25 (1941), No. 6, pp. 17–19, 36–37, figs. 3).—A general discussion and review of boron deficiency studies (20 references), with a summary and tabulation of the results of major field trials with boron for alfalfa and clover and grass.

A low-temperature basidiomycete causing early spring killing of grasses and legumes in Alberta, W. C. BROADFOOT and M. W. CORMACK (*Phytopathology*, 31 (1941), No. 11, pp. 1058–1059, fig. 1).—An unidentified low-temperature basidiomycete was found causing extensive killing of certain grasses and alfalfa in Alberta about the time of the first spring thaw, producing a snow mold on grasses and a crown rot on alfalfa. Inoculations have proved it highly virulent on certain grasses, winter wheat, alfalfa, sweetclover, and alsike and white Dutch clovers. The cardinal temperatures are around –4°, 15°, and 26° C. Clamp connections indicate the fungus to be a basidiomycete, but no sclerotia, fruiting bodies, or spores have been found.

Smut sori from ovarial and staminal tissues of certain grasses, E. D. HANSING and C. L. LEFEBVRE. (Kans. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 11, pp. 1043-1046, figs. 2).—Rudimentary ovaries of pedicellate and fertile ovaries of sessile spikelets of *Andropogon furcatus* were affected with *Sorosporium everhartii*. Pistillate sori were also observed in rudimentary ovaries of *A. furcatus* affected with *Sphacelotheca occidentalis* and of *Sorghum halepense* affected with *Sphacelotheca cruenta*. Sori developed from staminal tissue of *A. furcatus* affected with *Sorosporium everhartii* and from staminal and ovarial tissues of sorghum affected with either *Sphacelotheca cruenta* or *S. sorghi*. The male inflorescence of corn is often affected by *Ustilago zeae* and *Sorosporium reilianum*. Variations in the size and shape of these sori and correlations with the organs from the primordia of which they originated may have diagnostic importance.

Natural ways of transmission of the winter wheat mosaic virus, V. K. ZAZHURILO and G. M. SITNIKOVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 29 (1940), No. 5-6, pp. 429-432).—The mosaic virus was found to overwinter in infected winter wheat seedlings, and the earlier the winter crop was seeded the higher the incidence of infection. With spring wheat, the later sown crop was the one most strongly infected. The explanation of these conditions was found connected with the life history relations of the insect vector, *Deltocephalus striatus*, and the incubation period of the virus.

The occurrence of *Darluka filum* (Biv.) Cast. on cereal rusts in South India, T. S. RAMAKRISHNAN and I. L. NARASIMHALU (*Curr. Sci. [India]*, 10 (1941), No. 6, pp. 290-291, figs. 2).

Physiologische Besonderheiten bei der Bildung der an *Ustilago tritici* erkrankten Weizenähre [Physiological peculiarities in the development of wheat ears infected with loose smut (*U. tritici*)], P. V. SABUROVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 28 (1940), No. 3, pp. 270-273).

The wheat stem rust epidemic of Kansas in 1940, L. E. MELCHERS. (Kans. Expt. Sta.). (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 1941, Sup. 132, pp. 95-103, pls. 4).—This survey considers crop conditions leading up to the epidemic of 1940, climatic conditions in Kansas as affecting stem rust development in that year, northward spread of infection, route followed in the survey, magnitude and types of losses, and varietal susceptibility to stem rust.

Disease resistance of *Triticum timopheevi* transferred to common winter wheat, R. G. SHANDS. (U. S. D. A. and Univ. Wis.). (*Jour. Amer. Soc. Agron.*, 33 (1941), No. 8, pp. 709-712, fig. 1).—This paper briefly discusses the history of a hybrid with common wheat, its fertile progeny, and a few preliminary karyological observations. The results indicate that a number of the characters of *T. timopheevi*, including resistance to mildew, leaf rust, and stem rust, have been transferred to fertile types of common wheat and, furthermore, that several of these plant lines are fertile in hybrids with other wheat varieties.

The probability law in cotton seedling disease, K. S. CHESTER. (Okla. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 12, pp. 1078-1088, figs. 4).—In field and greenhouse, a mathematical analysis was made of the survival of cotton seedlings under various conditions of attack by *Glomerella gossypii*, *Fusarium moniliforme*, *Rhizoctonia solani*, and other seedling disease organisms, in an endeavor to find to what extent an infected seedling is hazardous to adjacent healthy seedlings. With freedom from serious *Rhizoctonia* attack, the mortality from infested seed followed a random distribution, agreeing with the distribution formula derived by expansion of the binomial equation. A skew distribution, with an excessive number of seedling failures in hills containing one or more infested seed, did not occur, indicating that in the absence of severe *Rhizoctonia*

attack diseased seedlings are not a hazard to adjacent healthy seedlings. This was confirmed by direct observations. Where *Rhizoctonia* was a factor, there was an excessive proportion of seedling failures in hills originally containing one or more diseased seedlings. These failures were not due to the "all-or-nothing" character of field accidents or to the original internal or external infestation of the seed but to soil-borne *Rhizoctonia* advancing in an all-or-nothing fashion. The findings agree with the greater usefulness of Ceresan seed treatments in the Southeastern States, where seed-borne infestations are of major importance in seedling disease, and the greater success of acid-delinting of seed in the Southwest where *Rhizoctonia* is the chief cause of seedling disease, since the acid treatment shortens the period of susceptibility to it. The bearings of these results on the planting value of partially infested cottonseed and on present needs in seed treatment are discussed.

The reaction of cotton varieties to Fusarium wilt and root-knot nematode. A. L. SMITH. (Ga. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 12, pp. 1099-1107, figs. 3).—Preliminary observations indicate that the more important cotton varieties currently planted in the southeastern United States vary widely in root knot resistance. Resistance to root knot appears associated with wilt resistance, but this is believed to be incidental, since some wilt-resistant varieties show no more root knot resistance than wilt-susceptible and semiresistant varieties. Root knot resistance was confined to wilt-resistant varieties originated in lighter Coastal Plain soils, whereas none of the wilt-resistant varieties originating in the heavier sparsely root knot nematode-infested soils of Mississippi and Louisiana exhibited root knot resistance. Varieties combining root knot and wilt resistance are required for Coastal Plain conditions. These observations indicate that, while such combined resistance has been secured in some cases without conscious effort, it may be highly important for the breeder and pathologist to devote some attention to root knot resistance. A system of numerical evaluation of root knot infestation in cotton is described showing that it is possible to classify increasing root knot severity by increasing numbers, with 0 representing plants void of root knot galls and 1-4 representing percentages of roots infested at increments of 25 percent.

The carbon utilization and carbohydrase activity of *Phymatotrichum*. L. M. BLANK and P. J. TALLEY. (Tex. Expt. Sta. coop. U. S. D. A.). (*Amer. Jour. Bot.*, 28 (1941), No. 7, pp. 564-569).—Measuring the growth of *P. omnivorum* on different types of carbohydrates under controlled conditions, the amount was found to depend in some cases on whether sterilization was by autoclaving or by alcohol. Glucose, fructose, and mannose (or compounds from which the fungus could obtain these simple sugars) proved to be the best C sources. Utilization of polysaccharides was correlated with ability to hydrolyze them and the rates at which they were hydrolyzed.

Onion yellow dwarf—a virus disease of onions. F. P. McWHORTER (*Oregon Sta. Cir. Inform.* 233 (1941), pp. 3, figs. 2).—Directions are given for control of this disease, first found in western Oregon fields in 1940.

Results of testing some laboratory methods for possible use in the detection of virus diseases in potato tubers. D. FOLSOM (*Maine Sta. Bul.* 407 (1941), pp. [4]+83-104).—In the past the most reliable method of seed-tuber selection has necessitated planting sample eyes in the greenhouse or in a southern region and growing the resulting plants there. It is thus obvious that there would be advantages in rapid, practical, and dependable methods of testing tubers for virus diseases. In the large number of tests here reported, investigating possible correlations of some 20 tuber characters with different virus diseases, about 50 gave an average difference in respect to the measured character correlated with

chronic disease, and about 90 gave no average difference with chronic disease. Recent infection was correlated with an average difference in 3 instances, whereas in about 35 there was no consistent tuber difference associated with recent infection. Average differences were much more common with leaf roll and spindle tuber than with mild mosaic or rugose mosaic.

In comparisons with regard to parts of the tuber, skin toughness increased from stem to bud end, whereas there was a decrease in flesh hardness and resistance to alternating current. The two ends were the same with respect to refractive index. Flesh hardness was less in the cortex than in the center and was still less between. With decrease in tuber weight there were trends to less loss in weight absolutely but more in percentage, less of a percentage injured by cold, more of the severe type of freezing injury in one comparison and less in another, more resistance to alternating current, less current generated, higher pH, and more water absorbed. Therefore tuber weight must be considered in any kind of test. Tuber weight had no apparent correlation with skin toughness, flesh hardness, resistance to alternating current, or refractive index. The region in which the tubers were produced had an apparent effect on pH but none on resistance to alternating current. The part of the field producing the crop influenced the effect of cold, but conditions of storage did not affect flesh hardness or freezing injury though influencing the refractive index. There was a varietal difference in freezing injury, refractive index, and resistance to alternating current. Various other comparisons are detailed.

These various facts prove the necessity of standardizing any tests of this kind, even if they are as simple as these, and of course the conclusions as to the effectiveness of the tests and as to the data on tuber characters may apply only to the conditions described for the particular tests reported upon.

There are 21 references.

The use of iodine in the control of potato ring rot and scab, P. A. ARK. (Univ. Calif.). (*Phytopathology*, 31 (1941), No. 10, pp. 954-956).—The spread of *Phytomonas sepedonica* infection by the seed-piece cutting knife was greatly reduced but not entirely prevented by dipping the knife in a 1 percent iodine solution. Treatment of the seed potatoes in this solution of iodine for 5 min. caused no injury to the "seed" and greatly reduced scab, but failed to control *Rhizoctonia solani* black scurf. For knife disinfection, an effective formula is said to be 38 gm. iodine, 76 gm. KI, 1 pt. glycerine, and 2 gal. water.

[Papers on sugar beet pathology] (*Amer. Soc. Sugar Beet Technol. Proc.*, 12] (1940), pt. 2, pp. 169-180, 191-240, figs. 2).—The following papers are of interest to phytopathology: Breeding for Resistance to Leaf Spot and Other Characters, by H. W. Dahlberg, A. C. Maxson, and H. E. Brewbaker (pp. 169-180); Further Studies of Sugar Beet Seed Ball Extracts With Special Reference to the Toxicity of Hydrolyzed Ammonia, by M. Stout and B. Tolman (p. 191) (U. S. D. A.); Resistance to *Fusarium* Yellows in Sugar Beets, by H. W. Bockstahler (pp. 191-198) (U. S. D. A. et al.); Effect of Mosaic Upon Yield of Seed by Sugar Beet Roots, by J. O. Gaskill (pp. 199-207), and Relation of 8-Inch and 16-Inch Spacing to Curly-Top Infection and Performances of Certain Curly-Top-Resistant Sugar Beet Varieties, by A. M. Murphy (p. 207) (both U. S. D. A.); *Verticillium* Wilt of Sugar Beet, by J. O. Gaskill and W. A. Kreutzer (pp. 207-208) (U. S. D. A. and Colo. Expt. Sta.); black root (pp. 208-213) and Boron Deficiency of Sugar Beets in the Puget Sound District of Washington (pp. 213-216), both by L. Campbell (Wash. Sta.); Soil and Seed Treatment Experiments With Sugar Beets for Control of Seedling Diseases (pp. 216-219), and Seedling Diseases, Phosphate Deficiency and *Fusarium* Yellows of Sugar Beets in the Rotations at the Huntley Field Station in Mon-

tana (pp. 219-223), both by M. M. Afanasiev (Mont. Sta.); *Aphanomyces* Root Rot of Sugar Beets as Influenced by Phosphate Application, by J. E. Kotila and G. H. Coons (pp. 223-225) (U. S. D. A.); 1939 Field Observations of Black Root Occurrence [in Sugar Beets], by M. W. Sergeant (pp. 226-228); [Sugar Beet] Root-Rot Survey 1938-39 Great Western Territory, by A. C. Maxson (pp. 228-229); and Borax as a Control for Heart Rot of Sugar Beets, by R. L. Cook (pp. 229-240) (Mich. Sta.)

A new leaf-spot resistant beet variety, G. H. COONS, D. STEWART, and J. O. GASKILL (U. S. D. A.). (*Sugar* [New York], 36 (1941), No. 7, pp. 30-33, figs. 2).—In this preliminary report, the release of a new leaf spot-resistant sugar beet variety, U. S. 215 X 216, expected to be more resistant and productive than European sorts and to be superior to the earlier introduction, is announced.

Changes in nitrogen and virus content of detached tobacco leaves in darkness, W. N. TAKAHASHI (Univ. Calif.). (*Phytopathology*, 31 (1941), No. 12, pp. 1117-1122).—Detached mature Turkish tobacco leaves inoculated 4 weeks previously with tobacco mosaic virus (mosaic), healthy detached leaves inoculated immediately after detachment (mosaic-inoculated), and noninoculated healthy detached leaves were cultured in distilled water in darkness. The juice was expressed from the leaves, treated with trichloroacetic acid and centrifuged. The changes in Kjeldahl N of the resulting precipitate and the supernatant liquid (soluble N) were followed during a 9-day culture period, and the remaining leaf residue was also analyzed for N. The changes in virus concentration were followed by the local lesion method on *Nicotiana glutinosa* half leaves. As the culture period progressed all three series showed a conspicuous increase in soluble N, largely at the expense of the leaf residue N, and increasing numbers of local lesions showed that virus increase had taken place under these conditions, particularly in the mosaic-inoculated series. Inclusion bodies in epidermal strips taken from mosaic leaves at the end of the test showed no signs of disintegration, indicating that these inclusions may not function as reserve protein and are not drawn upon by the starving host to support its respiration. Stream double refraction was exhibited by extracts from all mosaic leaves and 6-9 days' cultured mosaic-inoculated leaves, showing that prolonged dark culture does not greatly alter the form of the virus particles.

A distinctive strain of tobacco-mosaic virus from Plantago, F. O. HOLMES (*Phytopathology*, 31 (1941), No. 12, pp. 1089-1093, figs. 2).—A virus inducing mosaic in ribgrass (*P. lanceolata*) and in broad-leaved plantain (*P. major*) was found also to cause necrotic-ring patterns when inoculated into Turkish tobacco. Failure to inactivate it by heat (92° C. for 10 min.), its inability to form the characteristic necrotic primary lesions in tissues of *Nicotiana tabacum* or *N. sylvestris* already invaded by typical tobacco-mosaic virus, its precipitation by tobacco-mosaic-virus antiserum, and its response to the genic constitution of tobacco showed it to be a strain of tobacco-mosaic virus (*Marmor tabaci*). This ribgrass form, distinguished from previously known strains by its ability to form necrotic-ring lesions in tobacco, is named *M. tabaci plantaginis* n. var.

Synthesis of tobacco mosaic virus protein in relation to leaf chromoprotein and cell metabolism, M. W. WOODS and H. G. DUBUY. (Md. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 11, pp. 978-990, figs. 3).—HCN blocks a particular respiratory enzyme system ("A-system") and also blocks virus multiplication. Sufficiently prolonged N starvation brings on a reduction in activity of cyanide-sensitive respiration. Since virus multiplication depends on this respiration system, N starvation can thus prevent or retard it. A method is outlined for the quantitative extraction and separation of virus

protein and leaf chromoprotein, and previously undescribed properties of the latter are presented. Tobacco-mosaic protein synthesis closely parallels the synthesis of chromoprotein, and the data indicate that the virus may be formed from the same building units as the chromoprotein itself. The evidence suggests that tobacco-mosaic virus may be either an aberrant chondriosomal or chromoprotein derivative, or at least have a highly specific relationship to such proteins.

Resistance to the common mosaic disease of tobacco, E. E. CLAYTON and H. H. MCKINNEY. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 12, pp. 1140-1142, fig. 1).—From field tests of the practical merits of the Ambalema and glutinosa types of resistance to tobacco mosaic, it is concluded that under the tobacco-producing conditions prevailing in the United States the glutinosa type appears to have no practical value, since the prospects for achieving a completely localized necrotic reaction do not appear promising. On the other hand, the Ambalema type of resistance, after testing for 6 yr., has been maintained through numerous backcrosses, and it is predicted that tobacco varieties possessing Ambalema resistance will be introduced into cultivation in the near future.

Stomatal behavior in field tobacco, S. DIACHUN. (Ky. Expt. Sta.). (*Ky. Acad. Sci. Trans.*, 9 (1941), No. 2, pp. 20-23).—Continuing the studies on relation to tobacco wildfire, *Bacterium tabacum* (= *Phytomonas tabaci*) (E. S. R., 88, p. 77), the data presented indicate that although the stomata on the leaves tend to be open during the day and closed at night, several modifying factors may upset this tendency. There is a close correlation between stomatal width and the rate at which leaves can be water-soaked. When stomata are open, leaves can be water-soaked very rapidly; when closed, very slowly or not at all.

Unrelatedness of tobacco-streak and potato yellow-dwarf viruses, W. C. PRICE and L. M. BLACK (*Amer. Jour. Bot.*, 28 (1941), No. 7, pp. 594-595, fig. 1).—By means of cross protection tests to determine whether or not a close relationship (as claimed by some workers) exists between these two viruses, it was made apparent that plants thoroughly invaded by potato yellow dwarf virus, although protected from the severe strain, were not protected against infection with tobacco streak, and, conversely, plants thoroughly invaded by tobacco streak virus were not protected against the yellow dwarf virus. In each case, primary lesions and severe systemic infection resulted from the second inoculation. The data obtained demonstrate that these two viruses are not strains of one and the same virus and, in this sense, may be considered unrelated. It was also shown that neither virus is closely related to tobacco-mosaic, tobacco-necrosis, or tobacco-ring spot viruses.

A rosin-potash spreader for spraying hops for downy mildew control, G. R. HOERNER. (Coop. U. S. D. A.). (*Oregon Sta. Cir. Inform.* 236 (1941), pp. 2).—Directions are included on the preparation and use of a rosin-potash spreader recommended after trials of a large number over a 10-yr. period.

Pea varieties with pods resistant to *Ascochyta pisi* Lib., V. K. ZAZHURILLO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 29 (1940), No. 4, pp. 351-352).—The reactions of plants v. pods of 20 pea varieties to *Ascochyta* blight are discussed and tabulated.

A leaf spot of peas (*Pisum* sp.) caused by *Cercospora lathyrina*, J. L. WEIMER. (Ga. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 11, pp. 1031-1034, fig. 1).—A leaf spot of peas is reported and described as due to the same fungus as that causing a leaf spot of perennial sweet pea. It has been seen only at Experiment, Ga., on peas growing under a cloth shelter during late summer and early fall.

Fungi which cause pre-emergence injury to garden peas, G. T. S. BAYLIS (*Ann. Appl. Biol.*, 28 (1941), No. 3, pp. 210-218, pl. 1, figs. 2).—Examination of pea seedlings failing to emerge showed that attack had often occurred at a very early stage and frequently before germination. Various fungi were isolated from the cotyledons of diseased embryos, and *Pythium* spp. were obtained from almost every seedling axis. Of those tested, the *Pythium* and *Fusarium* species were the only ones found capable of inhibiting emergence in sterilized soil under conditions otherwise comparable to those in the field. The disease was attributed principally to *Pythium* spp., and such of the isolates as developed sexual organs were referable to *P. debaryanum* and *P. ultimum*. There are 20 references.

English pea yield more than doubled by seed treatment, J. A. CAMPBELL (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 9, p. 2).—This note reports damping-off and other rot organisms prevalent on certain heavy soils of Mississippi to have been successfully controlled, with resulting better stands and heavier yields, by seed treatments with organic mercurial and fixed copper dusts.

Root rot of pepper and pumpkin caused by *Phytophthora capsici*, C. M. TOMPKINS and C. M. TUCKER (Calif. and Mo. Expt. Stas.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 7, pp. 417-426, figs. 3).—The inception and spread of this root rot of pepper and pumpkin plants, prevalent in the San Joaquin Valley, Calif., is definitely favored by excessive moisture, inadequate soil drainage, and high air temperatures. The root system and basal part of the stems of both hosts show a soft, wet decay, and permanent wilting of the leaves occurs very suddenly, with ultimate collapse of the stem and lodging and death of the plants. The isolates from both plants are described. Infection was obtained in the greenhouse by adding the fungus to the wet, autoclaved soil of potted plants. The incubation period was 6-14 days for pepper and 12-21 days for pumpkin. Successful cross inoculations were made with pepper isolates to pumpkin, and vice versa. In both hosts all isolates caused damping-off of seedlings in the greenhouse and rotting of fruits in the laboratory. These isolates of *P. capsici* also proved pathogenic to squash, eggplant, and tomato. No resistance was found in any of the varieties of pepper and pumpkin tested under greenhouse conditions.

Injury to tomatoes by lightning, O. C. WHIPPLE (Univ. Wis.). (*Phytopathology*, 31 (1941), No. 11, pp. 1017-1022, figs. 3).—Lightning injury results in immediate death or collapse of the affected plant parts, and secondary changes follow rapidly. Since fields are often not visited for several days following an electrical storm, killed plants may be of little diagnostic value except that they show a prostrate condition. Plants mildly affected usually show certain characteristic symptoms, among the most conspicuous of which are collapse of the stem and drooping of the tops, various degrees of hollowing of the stem pith, collapse and desiccation of individual leaves of plants near the periphery of the "lightning spot," small longitudinal or circular stem lesions, irregular burnt areas on stems, leaves, and fruits, and blistering of the fruit surface and various degrees of cooking of underlying tissues.

Septoriose do tomateiro [Septorioses of tomato], A. COSTA, JR. (*Gênes [Minas Geraes]*, 2 (1941), No. 11, pp. 395-413, pls. 4).—This is a general review and study of the disease and its distribution; its cause (*Septoria lycopersici*), including isolation, morphology and physiology, taxonomy, life history, ecology, and hosts; and its control by fungicides, culture practices, and resistant varieties. There are 15 references.

Studies on the bitter-pit disease of apples, O. R. BUTLER and S. DUNN (*New Hampshire Sta. Tech. Bul.* 78 (1941), pp. 10).—Though the exact cause of this apparently nonparasitic disease is not known, it seems to be modified considerably by fertilizer and other environal factors, and there are notable differences in

varietal susceptibility, Baldwin and Northern Spy being most susceptible among the sorts grown in New Hampshire. As far as production was concerned, Ca, complete fertilizer, and K were not beneficial in the tests reported, P was of more value than K, and N and P were better than N and K. All things considered, there was no evidence that any fertilizer was better than N alone. For reduction of bitter pit, N and K were not as good as N and P. P reduced it, and K and N increased it. On the whole, the presence of S and P seemed to counteract the effects of N and K. K alone or with N should not be used. Ca seemed to be without effect except when N alone was used as fertilizer. In general, mulch kept the soil under it more moist, and nitrates in the soil were increased by it. There was no advantage for mulch in reducing bitter pit, but yields averaged somewhat better with it. Late harvesting aided in keeping down bitter pit development in storage.

New methods for scab control—is the new spray on the soil of value? K. J. KADOW and S. L. HOPPERSTEAD. (Univ. Del.). (*Md. Agr. Soc., Farm Bur., Rpt.*, 25 (1940), pp. 170-179, figs. 2).—A progress report on ground spraying for apple scab (*Venturia inaequalis*) control.

Ozone in apple storage, R. M. SMOCK and R. D. WATSON. (Cornell Univ.). (*Refrig. Engin.*, 42 (1941), No. 2, pp. 97-101, figs. 3).—In the tests described, use of ozone materially reduced the mold spore count of apples in storage rooms and checked the spread of rots on scabby fruit significantly. The effect of ozone on reducing the ripening rate of apples is not clear but is in favor of the ozone treatment. More study is needed relative to the effect on scald of apples in storage.

Interstate cooperative experiments on field spraying of sour cherries, H. W. THURSTON, JR., C. F. TAYLOR, A. B. GROVES, and H. J. MILLER. (Pa., W. Va., and Va. Expt. Stas.). (*Phytopathology*, 31 (1941), No. 11, pp. 1047-1050).—The results of 1940 cooperative spray tests with some 13 fungicides against the *Oocomyces hiemalis* leaf spot, conducted in Virginia, West Virginia, and Pennsylvania, are tabulated and discussed. Bordeaux mixture and tank-mix copper phosphate were eliminated because of their effect on fruit size, lime sulfur and phenothiazine because of consistent failure to control leaf spot, and certain other materials because of their inconsistent effect on leaf retention. "ZO" and Basil-cop gave excellent leaf retention in the West Virginia test, where the leaf spot epidemic began comparatively late, but did not stand up under the heavier infections prevailing in the other two States. Had the test been run in West Virginia alone, one or more additional years would have been necessary to make this fact apparent. The added value of such cooperative tests thus becomes apparent.

The line pattern virosis of the genus *Prunus*, D. CATION. (Mich. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 11, pp. 1004-1010, figs. 4).—Abundance or Red June plums whose leaves appear normal for the variety and with little or no mottling or other symptom expressions may transmit a disease to peach trees expressed as a faint mottling of either line-pattern or diffused types. This disease is expressed similarly on Mahaleb cherry leaves. The line-pattern disease, *Marmor lineopictum* n. sp., was shown to be carried on certain Abundance and Red June plums in several Michigan orchards. It was present in certain Abundance plum nursery stock, and, from this and similar sources of distribution, it is thought to be perhaps widespread on plum trees. On peach the symptoms are apparently similar to certain ones first described by Vallean (*E. S. R.*, 68, p. 211) and later by Thomas and Rawlins (*E. S. R.*, 82, p. 640) as the Vacaville disease. A disease of Abundance plums, with symptoms resembling an unnamed plum disease described by Vallean and perhaps similar to a disease on plums described by

Thomas and Hildebrand (H. S. R., 77, p. 62) did not transmit noticeable symptoms to peach in three inoculations.

Fruit gumming of Victoria plums.—Progress report, III, W. B. ADAM and T. G. GILLESPIE (Univ. Bristol, *Fruit and Veg. Preserv. Res. Sta., Campden, Ann. Rpt.*, 1940, pp. 43-47).—Treatment with boric acid by branch injection or spraying gave a significant fall in the percentage of plums containing internal gum.

Anthraxnose of black raspberry (black caps) in Oregon. S. M. ZELLER (Oregon Sta. Cir. Inform. 224 (1940), pp. 2).—Notes on the disease and its control, with special reference to Oregon.

Las podredumbres radiculares del cafeto [Root rots of coffee], J. A. ALVARADO (*Café el Salvador*, 11 (1941), No. 121, pp. 5-26, figs. 12).—A general conspectus of the root rots of coffee and their control.

Relation of *Ceratostomella radicola* to rhizosis of the date palm, D. E. BLISS. (Calif. Citrus Expt. Sta.). (*Phytopathology*, 31 (1941), No. 12, pp. 1123-1129, figs. 5).—This potentially serious disease has been known in the Coachella Valley, Calif., since 1933. A reddish brown discoloration of the pinnae is followed within a few days by rapid wilting and death of the leaves, the disturbance commencing in the lower whorls and progressing upward. The fruit stalks wilt suddenly, and before all the older leaves have wilted the tightly folded young leaves at the center of the crown lose turgor and become whitish. Affected palms may die within 4-6 weeks. The roots become necrotic and filled with fungi at an early stage, but the trunk and leaves are free from fungus attack until the tree is badly wilted. Among several fungi isolated from the roots, *C. radicola* was the only one proving strongly pathogenic on potted seedlings. Although some of the nonwounded inoculated plants became infected, a high percentage of the wound-inoculated plants were killed within 20 days afterwards. The leaf bases and primary roots were decayed and blackened by the fungus. Green, nonwounded dates of the Deglet Noor variety were also attacked. It cannot be definitely stated that *C. radicola* is the cause of rhizosis, since many mature palms die suddenly with all its symptoms except the presence of this fungus in the roots. However, *C. radicola* is sometimes associated with rhizosis, and when inoculated into wounded seedling date palms it causes rapid necrosis.

Studies on *Septoria passiflorae* n. sp. occurring on passion fruit, with special reference to its parasitism and physiology, A. J. LOUW (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 229 (1941), pp. 51, pls. 4, figs. 11; *Afrikaans abs.*, pp. 39-40).

Smoulder of daffodils, W. C. MOORE (*Daffodil Year-Book*, No. 11 (1940), pp. 33-36, pls. 3).—Notes (including control measures) are presented on "smoulder" or gray mold due to *Botrytis narcissicola*, which is said to be now widely distributed in the British Isles.

Eelworm in seedling daffodils, C. H. ELSTON (*Daffodil Yearbook*, No. 11 (1940), p. 31).—A note on nematode infestation of 2-year-old seedlings in boxes which was successfully eliminated by 1-hr. hot-water treatment of the bulbs at 110° F. in a small electric sterilizer.

Verticillium wilt of strawflower, C. M. TOMPKINS and P. A. ARK. (Univ. Calif.). (*Phytopathology*, 31 (1941), No. 12, pp. 1130-1134, figs. 3).—This *Verticillium* wilt appears to be the chief limiting factor in the culture of strawflower (*Helichrysum bracteatum*) in California, other diseases, such as aster yellows and mildews, being minor in importance. The causal organism was identified as *V. albo-atrum*, a common soil inhabitant. Single-spore cultures readily segregated it into conidial and mycelial types. Young strawflower plants were readily infected in 4-5 weeks under greenhouse conditions. The fungus apparently is not

seed-borne. The strawflower isolates proved pathogenic for Acala cotton, egg-plant, tomato, and sunflower. The disease can be controlled by using clean soil.

A *Fusarium* wilt of sweet william (*Dianthus barbatus*), W. C. SNYDER. (Univ. Calif.). (*Phytopathology*, 31 (1941), No. 11, pp. 1054-1056, fig. 1).—In this wilt disease, found in the San Francisco region, affected plants become yellow and stunted, the leaves assume a leathery character, and the vascular systems of the roots and lower stem become browned. A basal stem rot may also be associated. Plants may die within a month after transplanting to infested soil. Since the causal *Fusarium* failed to infect carnation though agreeing morphologically with that form, it is described as *F. oenysporum* f. *dianthi* n. f.

Damping-off of longleaf pine, W. C. DAVIS. (U. S. D. A. et al.). (*Phytopathology*, 31 (1941), No. 11, pp. 1011-1016).—The persistent rosette habit of *Pinus palustris* seedlings leads to unusual damping-off symptoms. *Rhizoctonia* sp. has been most frequently isolated, but species of *Pythium* have not been recovered. Control is complicated by the lengthened period of susceptibility due to the rosette habit. Tests indicated that probably neither a presowing treatment of the soil with formaldehyde nor spraying with bordeaux or Cupro-cide will materially reduce late losses. Use of ferrous sulfate and o-phosphoric acid, separately or in combination at seeding time, reduced losses in some nurseries, but the most consistent chemical control was obtained by sprinkling the seedlings with Semesan. This should be done in late afternoon or on cool or cloudy days to avoid "burning." In most nurseries it seems likely that use of highly viable seed, combined with sowing in shallow rows to a depth of about $\frac{1}{4}$ in. with sawdust covering, or broadcast-sowing with firming of the soil and subsequently covering with sawdust, will afford the most practical control methods. Further, it appears that added protection from this hazard would be obtained by adopting weeding and cultivation practices that tend to keep the soil away from the seedling bases.

A root disease of Jeffrey and ponderosa pine reproduction, A. J. OLSON. (Univ. Calif.). (*Phytopathology*, 31 (1941), No. 12, pp. 1063-1077, figs. 3).—A disease of *Pinus jeffreyi* and *P. ponderosa* on a cutover forest area in Lassen County, Calif., hitherto of little economic importance, induces an infiltration of pitch in diseased roots and root collars and may ultimately result in the death of affected trees. Diseased trees always occur near old stumps, and affected root systems are in contact either with roots of the stumps or with diseased roots of other infected trees. The disease is shown to be spread by root contacts and to be due to a fungus described as *Cunninghamella meinelkella* n. sp.

The relation of cultivated red currants to the white pine blister rust in New York State, W. H. SNELL (*Jour. Forestry*, 39 (1941), No. 10, pp. 859-867, fig. 1).—White pine blister rust control has involved complete removal of the cultivated European black currants and eradication of all other species of currants and gooseberries within 900 ft. of pine, except as this distance has been reduced or extended to meet unusual local conditions. Cultivated red currants have been eradicated along with the other species because there has been no available information as to how dangerous these plants are in proximity to pine, or at what distances from them they constitute a menace, if any at all. This paper shows that the literature generally agrees on the low degree of susceptibility of red currants and that it contains surprisingly few references to white pine infection originating from them. The main text of the paper presents observations and studies indicating that, in general, white pines even at very short distances from red currants are not infected with the blister rust, unless wild *Ribes* are at least as near to the pines as the red currants.

Willow blight in British Columbia, I. L. CONNERS, A. W. MCCALLUM, and J. E. BIER (*Phytopathology*, 31 (1941), No. 11, pp. 1056-1058, fig. 1).—Willow blight was discovered in British Columbia in 1940. *Physalospora miyabeana* was fruiting freely on the cankers, whereas *Fusicladium saliciperdu* was rare.

Control of the root-knot nematode by cultural practices, J. C. LE ROUX and F. J. STOFBERG (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 188 (1939), pp. 29, figs. 9).—The life history and symptoms induced by *Heterodera marioni* are described. In this work, infestations were effectively checked by starvation, eliminating all susceptible host plants. Following commercial control, only one susceptible annual crop can with safety be grown. Clean cultivation for periods of 9 and 12 mo. gave better control than the 6-mo. summer or the 6-mo. winter treatment.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[Contributions on wildlife research and management] (*U. S. Dept. Int., Fish and Wildlife Serv., Wildlife Leaflets* 166 (1940), pp. 2; 167, pp. 2; 168, pp. 5; 169, pp. 4, fig. 1; 170, pp. 21; 171, pp. 8; 172, pp. 18, pl. 1; 173, pp. 10, pls. 2; 174, pp. 39; 175, pp. 11).—Further contributions in this series (E. S. R., 84, p. 212) are as follows: Nos. 166, Infectious Myxomatosis of Domestic Animals (Mosquito Disease; Big-Head Disease), by F. D. McKenney and E. L. Vail; 167, Grubs [*Wohlfahrtia vigili*] in Minks, by J. E. Shillinger; 168, The Digestibility of Animal Products and Cereals by Minks, by J. K. Loosli, S. E. Smith, and L. A. Maynard (coop. U. S. D. A. and Cornell Univ.); 169, Mink Breeding—Elementary Principles, by R. K. Enders (coop. U. S. D. A. et al.); 170, The Annual Fur Catch of the United States; 171, The Java Sparrow [*Padda oryzivora*], by P. Knappen; 172, Suggestions for Combating Objectionable Roosts of Birds, With Special Reference to Those of Starlings, by E. R. Kalmbach; 173, Fryer Rabbit Production, by G. S. Templeton; 174, Abstract of Fur Laws, 1940-41, by F. G. Grimes; and 175, Big-Game Inventory of the United States, 1939.

Methods for estimating populations of mammals, L. R. DICE (*Jour. Wildlife Mangt.*, 5 (1941) No. 4, pp. 398-407).

A technique for trapping and tagging spotted skunks, W. D. CRABB. (Iowa Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 5 (1941), No. 4, pp. 371-374, pls. 4, figs. 5).

The intestinal phase of the resistance of rabbits to the larvae of *Taenia pisiformis*, A. B. and A. E. LEONARD (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 375-378).

The birds of North and Middle America, R. RIDGWAY and H. FRIEDMANN (*U. S. Natl. Mus. Bul.* 50 (1941), pt. 9, pp. LX+254, figs. 16).—This continuation of the descriptive catalog (E. S. R., 41, p. 547) takes up the families Gruidae (the cranes), Rallidae (rails, coots, and gallinules), Heliornithidae (sun grebes), and Eurypygidae (the sun bittersns).

A field guide to western birds, R. T. PETERSON (*Boston: Houghton Mifflin Co.*, 1941, pp. LXVIII+[2]+240, [pls. 46, figs. 40]; rev. in *Wilson Bul.*, 53 (1941), No. 3, pp. 203-204).—The review is by J. Moffitt.

Pondfish culture: A handbook on the culture of warm water game fishes of the United States, P. VIOSCA, JR. (*New Orleans: Pelican Pub. Co.*, [1937], pp. XXIII+260, [pl. 1], figs. 68).

Digestion in parasitic nematodes, I-III, W. P. ROGERS (*Jour. Helminthol.*, 18 (1940), No. 2-3, pp. 143-154, figs. 2; 19 (1941), No. 1-2, pp. 35-46, figs. 2; pp. 47-58, figs. 7).—Part 1 of this contribution deals with the digestion of carbohydrates (pp. 143-154), part 2 with the digestion of fats (pp. 35-46), and part 3 with the digestion of proteins (pp. 47-58).

The role of plastics in the field of entomology, D. B. WHELAN. (Univ. Nebr.). (*Jour. Kans. Ent. Soc.*, 14 (1941), No. 3, pp. 73-84).

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 669, 724-729, figs. 3).—Contributions presented (E. S. R., 86, p. 64) are: Mexican Bean Beetle in South Dakota, by N. P. Larson (p. 669) (S. Dak. State Col.); Type of Wire Screen Required for Excluding Cigarette Beetles and Tobacco Moths From Warehouses, by J. P. Vinzant and W. D. Reed (p. 724), and Hogshead Construction as a Barrier to Stored-Tobacco Insects, by W. D. Reed, R. W. Brubaker, and H. N. Pollard (pp. 724-725) (both U. S. D. A.); Effects of Pyrethrins Upon Blowflies, by L. D. Anderson and R. A. Hook (pp. 725-726) (Ohio State Univ.); Control of Thrips [*Frankliniella occidentalis* (Perg.)] on Seedling Cotton, by J. R. Eyer and J. T. Medler (pp. 726-727) (N. Mex. Expt. Sta.); Toxicity to the Codling Moth Larva of Phenothiazine Prepared With Allotropic Forms of Sulfur, by E. H. Siegler and L. E. Smith (p. 727), and On the Causes [Tobacco Thrips] of Peanut "Pouts," by F. W. Poos (pp. 727-728) (both U. S. D. A.); and Effects of Infra-red Irradiation on the American Cockroach, by G. F. MacLeod (pp. 728-729) (Univ. Calif.).

[Contributions on economic insects] (6. Cong. Internac. Ent., Madrid, 1935 (1940), II, pp. 405-411, 535-543, 549-589, 657-667, 677-703, 713-727, 743-757, 781-802, 811-816, 831-890, 937-942, pls. 21, figs. 35).—Among the contributions presented are the following: The Classification of the Coleoptera and Post-Embryological Research, by K. Mansour (pp. 405-411); Locusts as an International Problem, by B. P. Uvarov (pp. 535-543); La lucha contra la mosca de las cerezas *Rhagoletis cerasi* (L.) Loew [Control of a Cherry Fruitfly], by M. Benlloch and F. Domínguez (pp. 549-554); Utilisation des microbes dans la lutte contre les insectes nuisibles [Use of Microbes in the Combat of Noxious Insects], by S. and S. S. Metalnikov (pp. 555-566); Recent Advances in the Control of the Pink Boll-Worm (*Platyedra gossypiella*) by Natural Enemies, by M. Kamal (pp. 567-581); Las plagas del olivo en España [Insect Enemies of the Olive in Spain], by C. González de Andrés (pp. 583-589); Applicazioni della lotta artificiale e biologica per combattere qualcuno degli insetti più dannosi alla bieticoltura in Italia [Measures Employed in the Combat of Beet Insects in Italy], by C. Menozzi (pp. 657-667); La tensión superficial de las emulsiones en relación con su eficacia insecticida [The Surface Tension of Emulsions in Relation to Insecticidal Value], by S. Planes García (pp. 677-685); Experiencias de lucha contra la *Ceratitis capitata* con cazamoscas de vidrio [Experimental Work With Glass Bait Traps in Control of the Mediterranean Fruitfly], by F. Gómez Clemente (pp. 687-703); Experiencias de lucha contra la mosca del olivo (*Dacus oleae* Rossi) por medio de substancias atractivas [Experimental Work With Attractants for the Olive Fly], by R. Bohorquez (pp. 713-727); Introducción y difusión del *Aphelinus mali* (Hald.) en España [Introduction and Spread of *Aphelinus mali* in Spain], by J. Nonell Comas (pp. 743-750); Posibilidades de lucha biológica contra las orugas de la col [Possibilities of Biological Control of Cabbageworms], by P. Urquijo Landaluze (pp. 751-757); On the Use of Aeroplanes in Combatting Invading Swarms of the Red Locust [*Nomadacris septemfasciata* Serv.] With Arsenical Dust, by T. J. Naudé (pp. 781-796); Investigaciones sobre las orugas minadoras del maíz en Galicia (*Pyrausta nubilalis* Hbn. y *Sesamia vieteria* Stoll.) [Investigations of Corn Borers in Galicia], by P. Urquijo Landaluze (pp. 797-802); The Food-plants of *Nezara viridula* Linn. (Hem.: Pent.), by W. E. Hoffmann (pp. 811-816); The Cotton Leaf-Worm Problem in Egypt, by I. Bishara and M. S. El Zoheiry (pp. 831-843); Las plagas de langosta en España [The Grasshopper Plague in Spain], by J. del Cañizo (pp. 845-865); Controlling Insects From the Air—

A Review of Work Conducted in Canada, by A. Gibson (pp. 867-872); Survey of the Wood-Eating Insects in Government Buildings in Southern Sweden, by I. Trägårdh (pp. 873-878); On Some Aspects of Termite Damage in South Africa, by T. J. Naudé (pp. 879-886); Some Problems of Modern Forest Entomology, by I. Trägårdh (pp. 887-890); and The Problem of Races of *Anopheles quadrimaculatus* Say in the United States, by E. H. Hinman (pp. 937-942).

[Entomological investigations of the New Hampshire Station] (*New Hampshire Sta. Bul.* 330 (1941), pp. 30-31).—A progress report (E. S. R., 83, p. 796) by W. C. O'Kane, J. G. Conklin, L. C. Glover, and R. L. Blicke on studies on the penetration of ovicides and contact insecticides.

Proceedings of the Entomological Society of British Columbia (*Ent. Soc. Brit. Columbia, Proc.*, No. 37 (1941), pp. [1]+20).—Contributions presented (E. S. R., 83, p. 364) include: A Survey of the Rat Fleas of the Southern British Columbia Coast With Relation to Plague Studies, by G. P. Holland (pp. 1-5); Notes on the Life History of the June Beetle *Polyphylla perversa* Casey, by W. Downes and H. Andison (pp. 5-8); The Discovery of an Ixovotoxin in *Dermacentor andersoni* Eggs (Acarina: Ixodidae), by J. D. Gregson (pp. 9-10); Further Records of Siphonaptera for British Columbia, by G. P. Holland (pp. 10-14) (E. S. R., 83, p. 364); Ectoparasites of Birds and Mammals in British Columbia—VI, A Preliminary List of Parasitic Mites, by G. J. Spencer (pp. 14-18) (E. S. R., 83, p. 364); A Further Note on the Food Habits of the Brine Fly *Ephydra hians* Say, by I. J. Ward (p. 18) (E. S. R., 81, p. 672); A Preliminary List of the Species of *Culicoides* in Western Canada (Diptera: Ceratopogonidae), by L. C. Curtis (pp. 18-19); and Report on the Value of Plant Inspection in Relation to Pest and Disease Control in the Dominion of Canada, by H. F. Olds (pp. 19-20).

Insect and other pests of 1940, A. E. CAMERON (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 53 (1941), pp. 77-97, figs. 14).—A further report in this series (E. S. R., 83, p. 797).

Some injurious insects of agricultural plants and forest trees in Siam and Indo-China.—I, Aphididae, R. TAKAHASHI (*Formosa [Taiwan] Govt. Agr. Res. Inst. Rpt.* 78 (1941), pp. [1]+III+27, figs. 9).—This contribution lists 28 species from Siam and 4 from Indo-China, with biological notes on, or supplementary descriptions of, some of the species. Eight species and a variety are described as new.

Pests of rice, F. Q. OTANES and P. L. SISON (*Philippine Jour. Agr.*, 12 (1941), No. 2, pp. 211-261, pls. 18, fig. 1).—This account includes a list of 43 references to the literature.

Proceedings of the fifth annual Tobacco Insect Conference (*Ann. Tobacco Insect Conf. Proc.*, 5 (1941), pp. 20).—The proceedings of the Tobacco Insect Conference held at Oxford, N. C., July 22-24, 1941, are reported.

Important nursery insects of New Jersey, F. A. SORACE (*N. J. Dept. Agr. Cir.* 326 (1941), pp. 72, figs. 56).

Sulfur as a stomach insecticide, B. C. DICKINSON, C. M. MEADOWS, and E. D. WITMAN. (Ohio State Univ.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 656-659, figs. 3).—Laboratory tests of commercial powdered sulfur applied as a spray or dust to foliage and ingested by last-instar larvae of several species of leaf-eating insects showed that sulfur may be lethal to the southern armyworm, variegated cutworm, and fall armyworm. It was not toxic at high doses to the catalpa sphinx, salt-marsh caterpillar, fall webworm, Mexican bean beetle, and the Colorado potato beetle. Lethal doses produced characteristic symptoms within a few hours, i. e., inactivation, constipation, and regurgitation, followed after death

by blackening of part of the body, which remained turgid. It is pointed out that the toxic action of commercial sulfur as a stomach insecticide is not understood. A few tests on special fractions of sulfur against the southern armyworm suggested the desirability of further investigations on relations among particle size, allotropic form, and toxicity of pure sulfur.

The relative toxicity of some 2,4-dinitro-6-R-phenols, J. F. KAGY. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 660-669, figs. 3).—Report is made of an investigation of the relative toxicity to several species of insects and mites of some 2,4-dinitro-6-R-phenols in which R represents a hydrogen or certain alkyl or alicyclic groups. While the chemistry of the 2,4-dinitro-6-R-phenols is very similar, the physical properties vary considerably. A review of the literature and the additional data presented led to the conclusion that 2,4-dinitrophenol is considerably less toxic to insects and mites than 3,5-dinitro-o-cresol (2,4-dinitro-6-methylphenol).

In the study of the compounds as stomach poisons, some relations of structure to toxicity are pointed out. "Petroleum oil solutions of 2,4-dinitro-6-cyclohexylphenol were more toxic than petroleum oil solutions of 3,5-dinitro-o-cresol to the San Jose scale (*Aspidiotus perniciosus* Comstock), to the bean aphid (*Aphis rumicis* L.), and to newly hatched larvae of the codling moth (*Carpocap'a pomonella* L.). The petroleum oil solutions of the two compounds were not significantly different, however, in their toxicity to eggs of *Lygacus kalmii* Stål. Petroleum oil solutions of 2,4-dinitrophenol were much less toxic to eggs of *L. kalmii* than the solutions of 3,5-dinitro-o-cresol or 2,4-dinitro-6-cyclohexylphenol." An investigation concerned with the toxicity of some 2,4-dinitro-6-R-phenols in dust mixtures for the control of the citrus red mite (*Paratetranychus citri* (McG.)) is also reported. Certain literature relative to the pharmacology and toxicology of the 2,4-dinitro-6-R-phenols is reviewed.

Characteristics of different types of nicotine sprays, I, II (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 630-635, figs. 8; pp. 636-638).—This contribution is presented in two parts.

I. *Nicotine residues*, L. B. Norton and O. B. Billings (pp. 630-635) (N. Y. State Expt. Sta.).—In the work reported the residues from eight experimental nicotine sprays in the field were stripped from the apples, eliminating nicotine loss during transportation and making possible the securing of samples immediately after spraying. The findings show that the most rapid loss of nicotine normally occurs during drying of the spray. "The amounts of nicotine originally deposited by soluble nicotine and oil combinations are nearly as high as those by 'fixed' nictines. The fixed nictines lose only a small proportion of the original deposit during drying, while the soluble nictines may lose more than 75 percent during this period. Nicotine oleate and nicotine pectate yield a lower deposit at the same concentration than nicotine sulfate, probably because of run-off due to superior wetting properties. Nicotine oleate and nicotine pectate are lost from the fruit more rapidly and more completely than nicotine sulfate, probably because of lower chemical stability. Nicotine peat with rapeseed oil and nicotine bentonite without oil give about the same deposit and residue, while the nicotine peat with 1 pt. of blown rapeseed oil gives less, under the experimental conditions. Mineral oil and rapeseed oil show no apparent differences in either amount or permanence of deposit with nicotine sulfate or with nicotine oleate. The oil-nictines are less strongly affected by rain than the fixed nictines."

II. *Codling moth control*, R. Hansberry (pp. 636-638) (Cornell Univ.).—Report is made of the results of codling moth control work in the same orchard of 25-year-old Rhode Island Greening trees that was used in the nicotine residue studies noted above. The fruit in the preceding year had been 65-percent insect-

injured. A delayed dormant spray of oil-nicotine sulfate was followed by a pink calyx, and first cover spray of lead arsenate and lime-sulfur. Three cover sprays of the experimental materials were then applied on June 28, July 8, and July 19 for the first brood and a fourth on August 8-9 for the second brood. The findings, which include the percentage of injured fruit and total infestation and fruit drop for the several spray mixtures used, namely, petroleum oil-nicotine sulfate, petroleum oil-nicotine oleate, rapeseed oil-nicotine oleate, rapeseed oil-nicotine sulfate, rapeseed oil-nicotine peat, blown rapeseed oil-nicotine peat, nicotine pectate, and Black Leaf 155 Concentrate, are recorded in tables, but are regarded as tentative.

The use of petroleum oils as insecticides.—III, Oil deposit and the control of fruit tree leafroller and other apple pests, P. J. CHAPMAN, G. W. PEARCE, and A. W. AVENS. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 639-647, figs. 2).—Reporting further (E. S. R., 85, p. 503), data are presented which show the relation of oil deposits to insect control. A correlation was found to exist between the quantity of oil deposited on apple bark in spraying, as determined by the analysis of a sample of twigs, and the efficiency of the treatment in killing the eggs of the fruit tree leaf roller. "Expressed in terms of a surface unit, the minimum effective dosage required for this species is approximately 1.3 mg. oil per square inch of bark. This is the dosage when using the type of oil utilized in most of the tests reported. Greater or lesser amounts will be required for other petroleum oil types available. While oil deposition may be profoundly affected by the kind and amount of emulsifying agent used in the spray mixture, control was found rather directly related to the quantity of oil finally deposited regardless of how it became deposited. Thus there was little evidence obtained of any important effect on efficiency imparted by the emulsifier acting strictly in its role as a wetting and spreading agent. The dinitro insecticides used proved ineffective against the eggs of the leaf roller. These materials also failed to increase the efficiency of the treatment when combined with oil over that obtained separately with the oil.

"The fruit tree leaf roller egg parasite *Trichogrammatomyia tortricis* Girault was found to show essentially the same reaction to the various treatments tested as unparasitized eggs.

"Oil spray formulas advised for fruit tree leaf roller control should in most cases prove effective against the apple redbug. However, the data obtained suggest that approximately 1.5 mg. oil is the minimum effective deposit for this pest. The function of the emulsifier in wetting and spreading appears to constitute a more important factor in the control of the redbug than of leaf roller. The dinitro compounds gave negative results on redbug either when used alone or combined with oil. Dosages of oil found effective against the leaf roller and redbug proved ineffective against the rosy apple aphid in 1939 when the pest occurred in outbreak numbers in the experimental orchard. Control can eventually be effected with oil sprays containing a high percentage of oil, but it is doubtful that they would be acceptable treatments owing to the danger of tree injury at effective deposits. Between 3 and 4 mg. was the indicated minimum effective deposit per square inch of bark under infestation conditions obtaining in 1939."

Differentiation between toxic and suffocating effects of petroleum oils on larvae of the [northern] house mosquito (*Culex pipiens* L.) (Diptera), A. G. RICHARDS, JR. (*Amer. Ent. Soc. Trans.*, 67 (1941), No. 3, pp. 161-196, pls. 4).—Presented with a bibliography of 67 titles.

Present status of rotenone and rotenoids, R. C. ROARK. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 684-692).—This digest is presented with a list of 24 references to the literature cited.

Compatibility of bordeaux mixture and cube, R. A. FULTON and R. H. NELSON. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 647-649).—

Report is made of the results of combining ground cube root with bordeaux mixture, which has been under investigation in the laboratory and field. "In the laboratory, colorimetric and goldfish analyses indicated about a 20-percent reduction in the rotenone content of the mixture after 30 days. The reduction was about 40 percent after 62 days and 50 percent after 92 days, but no further change was detected even after 12 mo. In the field, a bordeaux-cube combination originally made up to contain 0.02 percent of rotenone, but which had deteriorated about 50 percent in rotenone content at the time of application, was tested against the Mexican bean beetle. The combination appeared equal in effectiveness and residual effect to a cube spray containing 0.015 percent of rotenone."

Experiments with several wetting agents in the removal of fluorine spray residue from apples sprayed with natural cryolite, E. H. KARR (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 676-684, figs. 2).—In experiments on the removal of fluorine spray residues from fruit sprayed with natural cryolite, wetting agents, including soap bark extract, Intramine-Y, Nekal BX, Vatsol, and Hydralene, were used in either the sodium silicate or the hydrochloric acid solution of a double process washing schedule. "The sodium silicate concentration was maintained at 9.6 percent by weight of the actual compound in the solution used for the first washing treatment. The hydrochloric acid concentration in the solution used for the second washing treatment was maintained at 1.5 percent actual HCl by weight. Every sample of fruit was exposed to each washing solution for 40 sec. at a temperature of 110° F. in a positive-control experimental fruit washer of a flotation type. The addition of either soap bark, Intramine-Y, Nekal BX, or Vatsol to the sodium silicate solution did not cause any particular change in the result obtained by the dual washing treatment. When Hydralene was added to the sodium silicate solution the effectiveness of the washing treatment was noticeably lowered. The addition of any one of the wetting agents to the hydrochloric acid solution reduced the effectiveness of the washing treatment. With the exception of soap bark, this reduction in effectiveness was considerable."

The use of fatty acids in insecticidal aerosols, W. N. SULLIVAN, L. D. GOODHUE, and J. H. FALES. (U. S. D. A.). (*Science*, 94 (1941), No. 2445, pp. 444-445).

Application of the aerosol to fumigation.—I, Stabilization of a naphthalene aerosol, W. N. SULLIVAN, L. D. GOODHUE, and J. H. FALES. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 650-653, fig. 1).—In toxicity tests against the housefly made in the Peet-Grady chamber, naphthalene was vaporized both alone and in the presence of smoke from a burning mixture containing cornstarch and sodium nitrate. "The effective period of dispersed naphthalene was greatly lengthened by vaporization in the presence of the smoke. This increased effectiveness seems to be due to adsorption of the insecticide on the inert particles. The presence of the inert particles changes the character of the deposit and the rate of crystallization as well as the size of the crystal. Instead of being collected mostly on the floor, the naphthalene was deposited more uniformly on all surfaces regardless of position. The difference in mortality between the lots of flies exposed to naphthalene with and without smoke was greater in covered than in open cages."

Comparative efficiency of zinc sulfate and sugar solutions for the simultaneous flotation of coccidial oöcysts and helminth eggs, M. M. FARR and G. W. LUTTERMOSE. (U. S. D. A.). (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 417-424).—A study of the results obtained by a modified direct centrifugal flotation examination of soil and fecal samples containing known and unknown numbers

of eggs and oocysts of chicken parasites is reported upon. It is concluded that zinc sulfate solution of a specific gravity of 1.200 is a more efficient medium for the centrifugal flotation of oocysts of the chicken coccidia *Eimeria acervulina*, *E. mitis*, *E. maxima*, and *E. tenella* than a sugar solution of a specific gravity of 1.270. However, the zinc sulfate is less efficient for floating the eggs of *Ascaridia lineata* and *Heterakis gallinae*. Sugar solution of a specific gravity of about 1.200 is probably a more efficient medium for floating eggs, but zinc sulfate of the same specific gravity is probably more efficient for floating oocysts in simultaneous centrifugal flotations of the eggs and oocysts of the chicken parasites mentioned. Although sugar solution (sp. gr. 1.200) is no more efficient than zinc sulfate solution (sp. gr. 1.200), it is more practical for the detection of these poultry parasites because (1) it is more easily obtained than zinc sulfate, (2) it is less expensive, and (3) it is a better mounting medium. Because of the modified direct centrifugal flotation technic, from 10 to 88 percent of the eggs and oocysts inoculated into soil and fecal samples were recovered.

Thrips injury of peanut seedlings, G. M. SHEAR and L. I. MILLER. (Va. Expt. Sta.). (U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 25 (1941), No. 19, pp. 470-474, pl. 1).—It is concluded that the so-called pouts disease of peanut seedlings results from the attack of thrips, of which the tobacco thrips and the flower thrips have been identified therewith. Tests made with tartar emetic-brown sugar spray have shown that it is not a satisfactory material for controlling the thrips on peanuts under field conditions.

Quantitative dietary studies on Phymata, W. V. BALDUF. (Univ. Ill.). (Jour. Econ. Ent., 34 (1941), No. 5, pp. 614-620).—In the dietary studies conducted, the details of which are tabulated, the predatory bug *P. pennsylvanica americana* Melin was used.

Breeding a potato resistant to the potato leafhopper, J. P. SLEESMAN and F. J. STEVENSON. (Ohio Expt. Sta. and U. S. D. A.). (Amer. Potato Jour., 18 (1941), No. 10, pp. 280-298).—A report of the nature and results of work under way since 1934, presented with a list of 13 citations.

Researches concerning Texas Tettigoniidae, F. B. ISELY (Ecol. Monog., 11 (1941), No. 4, pp. 457-475, figs. 5).—The studies reported are accompanied by a list of 43 references to the literature cited.

Experimental transmission of the mosaic of Canna indica, G. O. OCFEMIA, I. S. MACASPAC and H. F. YUAN (Philippine Agr., 30 (1941), No. 5, pp. 357-370, pls. 2).—It was found that the mosaic of *C. indica* can be transmitted to abacá by the cotton aphid and the corn leaf aphid, and that the cotton aphid can also transmit *C. indica* mosaic to *C. edulis* and two varieties of ornamental *Canna* species. Although the cotton aphid can transmit *C. indica* mosaic to varieties of ornamental *Canna* species and *C. edulis*, this aphid cannot transmit the mosaic of abacá to these plants. Neither can *Rhopalosiphum nymphaeae* (Linné) transmit abacá mosaic to ornamental *Canna* species and *C. edulis*. The cotton aphid can transmit *C. indica* mosaic to abacá seedlings after feeding for about 5 min. on diseased *C. indica*. Five cotton aphids are sufficient to effect transmission of *C. indica* mosaic to abacá seedlings. A virus-laden cotton aphid loses all of the virus when it feeds on the first plant. *C. indica* mosaic cannot be transmitted by *Aphis laburni* Kith., *Pentalonia nigronervosa* Coq., and *R. nymphaeae*.

Butterflies: A handbook of the butterflies of the United States, complete for the region north of the Potomac and Ohio Rivers and east of the Dakotas, R. W. MACY and H. H. SHEPARD (Minneapolis: Univ. Minn. Press, [1941], pp. VII+247, pls. 4, figs. [52]).

An infestation of the pandora moth (Coloradia pandora Blake) in lodgepole pine in Colorado, N. D. WYGANT. (U. S. D. A.). (Jour. Econ. Ent., 34

(1941), No. 5, pp. 697-702, fig. 1).—Report is made of general observations and limited studies in 1938 and 1939 of the life history and habits of the pandora moth in lodgepole pine on the Arapaho National Forest in north-central Colorado, where an infestation was discovered in August 1937. This moth has, as a rule, a 2-yr. life cycle, with a few individuals remaining in the pupal stage an extra year. The main emergence of the moths occurs in July of even years, with oviposition taking place very soon thereafter. The eggs hatch in about 40 days. The larvae pass through five stadiums, overwintering the first year in the second stadium on the twigs and attaining maturity the following July. They then pupate in cells in loose mineral soil at a depth of from 1 to 4 in., where they pass the second winter. The eggs form in the pupae in the spring, and the moths emerge in July. The epidemic had the aspects of becoming very serious until 1939, when natural control factors greatly reduced the population. There was at least a 50-percent mortality of the larvae during the winter of 1938-39, probably from low winter temperatures. A wilt disease killed approximately 60 percent of the remaining larvae in the fourth and fifth stadiums in June and July 1939. The affected larvae turned orange brown and their body contents became fluid. At the time the larvae were entering the soil, July 1939, approximately 43 percent of the remaining population were killed by the effects of heat and drought. Only one species of parasite, *Apanteles* sp., was reared. Bears and squirrels fed upon the pupae.

Concentrated spray applied with an autogiro for control of cankerworms, R. R. WHITTEN, S. F. POTTS, and E. H. FRANCIS. (U. S. D. A. et al.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 692-696, figs. 5).—The results of comparative tests on the control of the spring cankerworm and the fall cankerworm in the National Historical Park at Morristown, N. J., in which the applications were made with a specially equipped autogiro, are reported. The tests included the treatment of large woodland tracts with a concentrated spray mixture of lead arsenate, fish oil, paraffin oil, and water; a lead arsenate dust impregnated with paraffin oil; and a proprietary colloidal lead arsenate spray. For comparison certain areas were left untreated, and other areas were treated with a standard lead arsenate, fish oil, and water spray applied with a high-pressure outfit drawn by a truck. The results showed a marked reduction in the amount of feeding in the areas treated with the concentrated lead arsenate spray by means of the autogiro. This reduction is thought to be due to the improved coverage in the tops of the trees and to the improved adherence of the spray, apparently because of better atomization and an increased amount of fish oil per given quantity of lead arsenate. In all respects treatment by the autogiro compared favorably with that of the truck-drawn sprayer, and the cost per acre was less. Although measurable control was obtained in the area dusted with an autogiro, some difficulty was encountered in regulating the drift of the dust.

[Codling moth control] (*Vermont Sta. Bul.* 475 (1941), p. 35).—The results of studies to determine the periods of moth emergence and flight are briefly reported by M. B. Cummings and C. H. Blasberg.

Comparative injury by the European corn borer to open-pollinated and hybrid field corn, L. H. PATCH, G. W. STILL, B. A. APP, and C. A. CROOKS. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 63 (1941), No. 6, pp. 355-368, figs. 3).—Various strains of corn grown in Ohio from 1929 to 1933 were subjected to different known levels of borer population induced by placing egg masses on the plants by hand. Reduction in the marketable yield occurred through an increase in the number of earless plants and plants bearing unmarketable ears and through a reduction in the ear size on plants bearing marketable ears. Total reduction in marketable yield per acre per borer per plant was equivalent to the yield of

about 292 hybrid or open-pollinated plants bearing marketable ears in the absence of borers. Size of marketable ears was reduced about 2.5 percent per borer per plant in both the hybrids and the open-pollinated varieties. As compared with the absence of borers, the marketable yield of the hybrids was reduced 2.99 percent and that of open-pollinated varieties 3.64 percent per borer per plant. In the case of the hybrids the advantage was due to the difference in the rate of increase per borer per plant in the number of earless plants and plants bearing unmarketable ears per acre. Approximately 8.5 percent of the hybrid and 10.5 percent of the open-pollinated plants would have been broken below the ear in the absence of borers.

Hibernation of the corn earworm in southeastern Georgia. G. W. BARBER (*U. S. Dept. Agr., Tech. Bul. 791 (1941), pp. 17*).—Corn earworm hibernation was studied during the years 1930 to 1933, inclusive, in Chatham County. An average of 51 percent (range 30 to 80 percent) of the individuals that entered soil in cages to pupate during the fall survived the following spring. Larvae dug pupal burrows from less than 1 to more than 10 in. deep. Three types of emergence were noted—immediate, delayed within the current year, and delayed until the following year. Moths emerged from May 1 to July 23 in 1931, from April 2 to June 27 in 1932, and from April 18 to July 27 in 1933. The variation in depth to which larvae burrowed apparently enables the earworm to survive disasters that might befall the active stages above ground, since resting pupae were continuously present in the soil and moths emerged throughout the growing season. As few of the larvae that mature in early corn hibernate, it is concluded that if all field corn of an area could be planted early and be followed by crops that are not attractive as food plants for earworms, overwintering populations would be reduced, and a lowering of the level of population of the insect might result.

Some of the more important factors governing the flight of European corn borer moths to electric traps, G. A. FROST and T. E. HENTON. (*Ind. Expt. Sta. coop. U. S. D. A.*). (*Jour. Econ. Ent., 34 (1941), No. 5, pp. 599-604*).—The basic results secured from studies on some of the more important factors influencing the flight of European corn borer moths to electric traps, here reported, have shown that the moths prefer certain color bands of the visible spectrum. The violet-blue band proved the most attractive. "In a comparison of H-4 and CX lamps it was found that the H-4 lamp, from which the percentage of over-all input radiated in the violet and blue spectral bands was approximately 4 times the percentage of these colors radiated by the CX lamp, attracted approximately 10 times as many moths as did the CX lamp. Ultra-violet radiation below 3,200 angstroms did not add to the attractiveness of lamps as a lure for corn borer moths, and the moths showed no preference for lamps radiating ultraviolet energy of 2,967 a. u. The size of the luminous area is of some importance in attracting the moths. An increase in the ratio of the size of the luminous area from 1 to 8 times increased the attractiveness of the radiant energy source approximately 5 times. The intensity of the source of the radiant energy in the region visible to the naked eye is an important factor affecting the attractiveness of lamps to the European corn borer. The number of moths attracted to the radiant energy was in almost direct proportion to the intensity of light visible to the human eye. Field studies indicated that the corn borer moths showed a preference for those traps which were placed on the high spots of the field when corn heights were about equal. Moths were captured in the greatest numbers when the traps were operated just above the level of the corn. No significant difference was noted in catches from four types of traps having differently shaped electrocutor grids."

Practical control of the European corn borer, N. TURNER. (Conn. [New Haven] Expt. Sta.). (*Conn. Veg. Growers' Assoc. Rpt., 1940, pp. 65-66*).—Brief report is made of an experiment which shows that dusting early corn is highly profitable and commercially feasible.

Histochemical detection of glycogen in blood cells of the southern armyworm (*Prodenia eridania*) and in other tissues, especially midgut epithelium, J. F. YEAGER and S. C. MUNSON. (U. S. D. A.). (*Jour. Agr. Res. [U. S.], 63 (1941), No. 5, pp. 257-294, pls. 14, figs. 3*).—Glycogen may appear normally in the blood cells, midgut epithelial cells, and certain other tissues of southern armyworm larvae, but it does not occur in blood or midgut cells at the time of hatching. Glycogen indices demonstrate that blood-cell glycogen increases during normal larval development to attain a maximum in the prepupa; after pupation it rapidly decreases and remains at a low level during most of the pupal period, at the end of which it tends to disappear. Blood-cell glycogen occurs infrequently in the first instar and probably in the adult. When newly hatched larvae are starved, neither blood-cell nor midgut-cell glycogen appears up to death, but when given food with sufficient carbohydrate, particularly glucose, glycogen occurs, appearing sooner in midgut than in blood cells. Blood-cell glycogen decreases or disappears during starvation and increases after intake of food containing carbohydrate, when 85 percent of the blood cells may contain glycogen inclusions. Most of the blood-cell types, particularly the plasmatocytes and cystocytes, may contain glycogen inclusions under these circumstances. These inclusions tend to be fewer and larger in the plasmatocytes than in the cystocytes and may occur in cells undergoing mitosis. The average glycogen counts from nonligatured larvae and from the anterior and posterior portions of ligatured larvae have similar forms. Polysaccharide occurs in the following tissues of larvae fed a high carbohydrate diet: Ganglia and connectives of the ventral nerve cord, labial glands, Malpighian tubes, fat body, oenocytes, gonads, pericardial cells, integument, foregut and hind-gut walls, and striated fibers of body, gut, cardiac, and alary muscles.

It is concluded that the southern armyworm is not exceptional in possessing blood-cell glycogen. This glycogen represents storage rather than transportation of foodstuff; therefore, carbohydrate storage is one function of these blood cells. The blood cells possess mechanisms for synthesis and hydrolysis of glycogen. Midgut-cell glycogen indicates storage of reserve carbohydrate rather than a glucose-absorbing mechanism. Although the fat body may store the largest amount of glycogen, glycogen synthesis also occurs in other tissues where glycogen is found. Stored glycogen probably occurs in both soluble and relatively insoluble form.

***Culex quinquefasciatus*, a new vector of *Plasmodium gallinaceum*, I. VARGAS and E. BELTRÁN** (*Science, 94 (1941), No. 2443, pp. 389-390*).—A southern house mosquito that fed upon a chicken infected with *P. gallinaceum* and was kept at ordinary laboratory temperatures approximating 20°-25° C. was found to contain sporozoites in its salivary glands upon dissection 29 days later.

The mosquitoes of Arkansas, S. J. CARPENTER (*Little Rock, Ark.: State Bd. Health, 1941, pp. 87, pls. 15*).—A revised edition (E. S. R., 84, p. 85).

New western Dolichopodidae (Diptera), F. C. HARMSTON and G. F. KNOWLTON. (Utah Expt. Sta.). (*Jour. Kans. Ent. Soc., 14 (1941), No. 3, pp. 92-97, figs. 8*).—Two species of the genus *Dolichopus* and one each of *Medeterus* and *Polymedon* are described as new.

The transmission of anaplasmosis by horseflies (Tabanidae), D. E. HOWELL, C. E. SANBORN, L. E. ROZEBOOM, G. W. STILES, and L. H. MOE (*Oklahoma Sta. Tech. Bul. 11 (1941), pp. 23*).—Epidemiological evidence indicates

that horseflies may be important in the transmission of anaplasmosis. Bites of flies just fed on clinical or carrier cases of anaplasmosis will transfer the disease to healthy animals. Fewer bites are necessary if the infecting animal is in the acute stage of the disease than if it is a carrier. Bites obtained 5 min. or more after the infective feed were not effective. Seven species of *Tabanus* transmitted the disease. It is concluded that horseflies may be important vectors of anaplasmosis among animals in the same herd, but can have little influence on the spread of the disease to animals more than a short distance away.

The Amazon fly under drought conditions in British Guiana, L. D. CLEARE (*Trop. Agr. [Trinidad]*, 18 (1941), No. 7, pp. 131-134).—A comparison of surveys of the Amazon fly made in British Guiana in 1937-38 and 1939-40 indicates that it has maintained its position as a parasite of the sugarcane borer since its introduction into that country in 1933. The prolonged drought that occurred from August 1939 to April 1940, during which the rainfall in the localities examined ranged between 12.75 and 18.38 in., did not affect the status of the fly as a parasite of the borer, and it is considered evident that under British Guiana conditions at least it can adapt itself to such prolonged dry periods.

Some biological observations of the adults of the apple maggot and the cherry fruitflies, W. W. MIDDLEKAUFF. (Cornell Univ.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 621-624, figs. 3).—The work reported relates to the weights of 24-hr. *Rhagoletis* adults, aphid honeydew as food for the apple maggot, parasites from *Ragoletis* puparia, and tests for the presence of tarsal chemoreceptors. The hymenopterous parasites recorded from puparia of the three *Rhagoletis* species are (1) from *R. pomonella* (Walsh), *Opius lectus* Gah., *O. ferrugineus* Gah., *Aphaereta muscae* Ashm., *Galesus* n. sp., and Eulophidae sp.; (2) from *R. cingulata* (Loew), *O. ferrugineus*; and (3) from *R. fausta* (O. S.), *Opius* sp. (*lectus-lectoides* complex), *Pachycrepoides dubius* Ashm., and *Eucoila* sp. In the feeding experiment in which aphid honeydew was used as food five females survived from 7 to 29 days, with an average of 21.6, and five males survived from 23 to 42 days, with an average of 29.8. Controls supplied with water alone were all dead within 5 days. Controls fed yeast and honey and held in 6 by 6 by 6-in. cages survived an average of 40 days and a maximum of 92 days.

Toxicological studies with adults of apple maggot and cherry fruitflies, W. W. MIDDLEKAUFF and R. HANSBERRY. (Cornell Univ.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 625-630, figs. 4).—Methods of obtaining pupae and of rearing and feeding the adults of the apple maggot, black cherry fruitfly, and cherry fruitfly are described. "The median lethal doses of trisodium arsenite and trisodium arsenate were calculated for these species by a technic whereby the individual flies were fed on solutions, dosage being determined by weight differences. No differences in the toxicities of trivalent and pentavalent arsenic were noted. The median lethal dose of trisodium arsenite and trisodium arsenate for the apple maggot was 0.10 and 0.09 mg. metallic As per gram of body weight, respectively, as compared to 0.08 and 0.07 mg./gm. for *Rhagoletis cingulata*. The median lethal dose of trisodium arsenate for *R. fausta* was 0.07 mg. As/gm. The most toxic substance tested, Reinecke salt, gave a median lethal dose of 0.0079 mg./gm. Compounds of nicotine, although decidedly toxic in cage tests, were generally too repellent or too emetic in individual tests to be effective. Nicotine alkaloid was repellent at the lowest concentration used, 0.0156 mg./cc. No correlation between solubility of the nicotine compounds and repellency could be noted. In laboratory cage tests, calcium arsenate always killed more quickly than lead arsenate, and again the cherry fruitflies were more susceptible to the arsenicals than was the apple maggot. Seven days were necessary to obtain

50-percent mortality of apple maggots caged with no other food than apples sprayed with lead arsenate in 20 percent sucrose."

Observations on the natural control of sheep blowflies in South Africa.—I, Predatory wasps of the genus *Bembix*, Fabr., G. C. ULLYETT and A. H. DE VRIES (*Union So. Africa Dept. Agr. and Forestry, Sci. Bul.* 224 (1940), pp. 23, figs. 8).—Studies of the life history and habits of *B. olivata* Dahlb. and *B. capensis* Lep. have led to the conclusion that while *Bembix* wasps play an important role in the natural control of blowflies any attempt to increase their effectiveness by rearing and liberations would not be successful.

The detection of poliomyelitis virus in flies, J. R. PAUL, J. D. TRASK, M. B. BISHOP, J. L. MELNICK, and A. E. CASEY. (La. State Univ. et al.). (*Science*, 94 (1941), No. 2443, pp. 395-396).—Two instances are described in which the virus of poliomyelitis was detected in collections of flies made in the field during epidemics of infantile paralysis. The first positive test was obtained from a summer camp in Connecticut and resulted from the inoculation of monkeys with an emulsion composite of from 1,000 to 1,200 flies representing a number of species. The second infection was obtained from the inoculation of a sample of flies obtained in the vicinity of Jasper, Ala., where the disease was epidemic in the summer of 1941.

Venezuelan diptera, I, J. R. MALLOCH (*Bol. Soc. Venez. Cien. Nat.*, 7 (1941), No. 48, pp. 123-131, figs. 3).—A new trypetid genus *Neorhabdochaeta*, of which *N. anduzei* n. sp. is a genotype, is erected and three new varieties of the sapromyzid genus *Setulina* are described.

A comparative study of rodent and burrow flea populations, M. A. STEWART and F. C. EVANS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 1, pp. 140-142, figs. 2).

A preliminary report on control of the western twelve-spotted cucumber beetle in orchards, A. E. MICHELbacher, G. F. MACLEOD, and R. F. SMITH. (Univ. Calif.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 709-716, figs. 3).—Control work is reported with the western spotted cucumber beetle, which for a number of years has been known to be a serious pest of ripening deciduous fruits in several localities in California due to the damage caused by direct feeding and through the large losses that have resulted from the spreading of the brown rot organism. Infestations of the beetles apparently arise from migrations of the pest from outside of the orchards, trees with dense foliage being preferred as feeding places. In the Brentwood area of California, where in 1938 the losses were so great that an investigation was asked for, the highest populations in 1940 were encountered in the fringe of orchards adjacent to the uncultivated land. In some orchards that year the peak population per tree exceeded 700 beetles. Since the beetles do not feed to any extent on green fruit, control measures are necessary only during the ripening period. "The most effective dusts used contain pyrethrum. A pyrethrum dust to be effective must have either some special solvent added or be used with some materials such as Lethane. Effective dusts used had pyrethrin contents of 0.1 to 0.2 percent and contained 1 or 2 percent Lethane or special solvent. To insure good control, a dust should be applied at the rate of about 50 lb. to the acre. The temperature should not be higher than 63° F., and if there is any drift it should be into the area already treated. A drift into the nondusted portion of an orchard will knock the beetles from the trees with a sublethal dosage. Under ideal conditions, mortalities of from 90 to nearly 100 percent can be expected. For satisfactory control, as many as two dustings may be necessary."

Resistance of corn strains to the southern corn rootworm (*Diabrotica duodecimpunctata* F.), J. H. BIGGER, R. O. SNELLING, and R. A. BLANCHARD.

(Ill. Expt. Sta. coop. U. S. D. A. and Ill. Nat. Hist. Survey). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 605-613, figs. 3).—Infestation by the southern corn rootworm caused increases in lodging of the plants, in the moisture content of the ears at harvest, and in the proportion of poorly filled ears and unsound corn. The resistance of corn strains to larval attack was measured in the experiments conducted by their resistance to root lodging on soil known to be infested with the insects. Lodging data obtained on inbred lines and single crosses during a 3-yr. period in several localities in Illinois indicate a differential response of the plants to larval attack. The Indiana inbred line 38-11 was outstanding in its resistance to lodging following rootworm attack either as an inbred line or in hybrid combinations. Some inbred lines suffered markedly less leaf injury from the feeding activity of the adult insects than other lines grown in the same experiment. The resistance to the injury caused by the southern corn rootworm is shown to be heritable. The development and use of resistant strains appears to be the only practical method of reducing the damage.

Winter survival of the prairie grain wireworm at different soil depths, J. A. MUNBO and H. S. TELFORD (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 1, p. 3).—The results of overwintering studies indicated that prairie grain wireworm (*Ludius aereipennis destructor* Brown) larvae may overwinter equally well at depths from 3 to 21 in. in the soil.

Wireworm populations as related to potato tuber injury, J. A. MUNBO and H. S. TELFORD (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 1, p. 4).—It appears that an average population of one wireworm per cubic foot of soil is able to cause nearly 43 percent tuber injury to potatoes.

The revival of cigarette beetle larvae fumigated with hydrocyanic acid, E. M. LIVINGSTONE and W. D. REED. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 653-656).—Following a review of earlier work, with references to the literature, report is made of observations of the revival of cigarette beetle larvae after fumigation with various concentrations of hydrocyanic acid gas for different exposure periods, the details being presented in a table. Full-grown larvae were exposed to concentrations of 5, 10, and 15 mg. per liter for 1, 2, and 3 hr. For each exposure period there was a gradual decrease in larval revival as the concentration of the gas increased, and for each concentration of gas there was a gradual decrease in revival as the length of exposure increased. Larval revival increased gradually from day to day until the point of maximum revival was reached, and after that there appeared to be little or no relation between revival and time following fumigation.

Progress report on studies of *Hypera brunneipennis* (Boh.) in the Yuma Valley of Arizona, W. C. McDUFFIE (*U. S. Dept. Agr., Bur. Ent. and Plant Quar.*, 1941, E-551, pp. 20, pl. 1).

Cold hardiness of two species of bark beetles in California forests, J. S. YUILL. (U. S. D. A.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 702-709, figs. 6).—The results of a 4-yr. study on the effect of low temperatures on the larvae of two of the principal timber-killing bark beetles of the California region, the western pine beetle and the mountain pine beetle, are reported. In the course of this work 60 tests were conducted in which over 25,000 larvae were subjected to various temperature conditions. In California overwintering larvae of the western pine beetle are killed by a temperature range of 5° to -7.5° F. and those of the mountain pine beetle by a range of 15° to -12.5°. Prolonged exposures increase mortality in the upper critical range, but as the temperature is reduced the intensity of the cold (temperature point) becomes the governing factor rather than the length of the exposure. Cold hardiness varies with the season. With larvae of the western pine beetle the difference between the sum-

mer state and the winter state is relatively small, and the change from the former to the latter takes place in a comparatively short time. With larvae of the mountain pine beetle the resistance gradually increases as the season becomes cooler and covers a wider range than does that of the other species. Larvae of the mountain pine beetle show a pronounced difference in cold hardiness when developing in different hosts. Those from lodgepole and ponderosa are more resistant than those from sugar pine. In the northeastern portion of the State cold waves of such intensity occasionally occur that overwintering broods of the western pine beetle are reduced by as much as 65 percent. In other areas the winter mortality is never extensive. Mountain pine beetle larvae are rarely, if ever, killed by winter temperatures in the California region. The consideration of winter mortality in planning control operations is discussed.

The occurrence in Kansas of the sugar-cane rootstock weevil *Anacetrinus deplanatus* Csy. (Coleoptera: Curculionidae), H. R. BRYSON. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 14 (1941), No. 3, pp. 84-90, pl. 1).—It is pointed out that *A. deplanatus*, a sugarcane rootstock weevil found attacking sorghum in Kansas, may become a pest of importance due to the manner in which it attacks the plant and the amount of injury that one larva can cause.

Observations on the purported resistance of the honeybee to American foulbrood, J. E. ECKERT. (Univ. Calif.). (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 720-723).—Data from fall and spring examinations of combs for symptoms of foulbrood are presented in tables. It is concluded that, until more dependably resistant strains of bees can be produced through years of careful selection and breeding, beekeepers should not pin their faith on this way to solve their disease problem, but should continue to eliminate all traces of American foulbrood by burning diseased colonies as soon as discovered.

Electric heating of beehives.—Preliminary report, E. B. WEDMORE (London: Brit. Elect. and Allied Indus. Res. Assoc., 1941, pp. [1]+19+[5], figs. 5).

A 10-year summary of honeyflow records, O. W. PARK. (Iowa Expt. Sta.). (*Iowa State Hort. Soc. [Rpt.]*, 75 (1940), pp. 394-400).

Some characteristics of the oriental honeybee *Apis indica* F. in China, C. R. KELLOGG (*Jour. Econ. Ent.*, 34 (1941), No. 5, pp. 717-719).—This contribution relates to *A. indica*, found throughout Japan, China, India, the Philippine Islands, Indo-China, and the Malay region. Until the recent introduction of the honeybee from abroad, it was the main source of honey there, and it is still the main source of honey for local consumption in China.

A new species of the *Eurytoma rhois* complex from the seeds of *Schmaltzia* (*Rhus*) *trilobata* (Eurytomidae), R. E. BUGBEE. (Kans. State Col.). (*Jour. Kans. Ent. Soc.*, 14 (1941), No. 3, pp. 98-102, figs. 6).—Under the name *E. seminis*, a eurytomid infesting the seeds of *S. (Rhus) trilobata* in Kansas and Oklahoma is described as new. Brief notes on the biology of this hymenopteron are included.

The diapause and related phenomena in *Gilpinia polytoma* (Hartig), I, II, M. L. PREBBLE (*Canad. Jour. Res.*, 19 (1941), No. 10, Sect. D, pp. 295-322, figs. 3; pp. 323-346, figs. 2).—The first two of five contributions.

I. *Factors influencing the inception of diapause* (pp. 295-322).—This includes a review of the literature on diapause and an outline of the life cycle of the European spruce sawfly in Canada, especially the developmental stages within the cocoon. In studies of factors influencing the inception of diapause, evidence has been secured from offspring of stock from one-generation and two-generation areas that there are genetic differences within the species with respect to the capacity for development without diapause. Environmental factors are capable of bringing on diapause, and such factors are obviously

operative during the development of the last seasonal generation of "emergent" field populations. However, analysis of weather conditions and incidence of diapause in such field populations failed to indicate correlation between the degree of diapause and any one environmental factor. A list of 85 references to the literature is included.

II. *Factors influencing the breaking of diapause* (pp. 323-346).—Field and laboratory experiments conducted have shown the importance of a period of "cold-rest" at a temperature below the threshold of development as a requirement for overcoming diapause in the spruce sawfly, especially in stock from a one-generation area. After cold-rest, maximal development results at a temperature of from 74° to 75° F. or higher and after contact with water. Temperatures in the field are lower and fail to promote as high development as may be obtained in the laboratory. However, temperature variations between 65° and 45° evidently have little influence on the degree of emergence from the diapause condition, though speed of development is directly affected. The benefit of contact with water is reduced or lost if contact occurs only while soil temperature remains below the threshold of development, and if the moisture taken up in the cocoon wall is lost by evaporation before it can be absorbed by the larva. The role of the cocoon in water exchanges and differential effects of abnormal weather conditions upon intracocoon development in stocks in one-generation and two-generation areas are described.

Ornithodoros parkeri Cooley: Observations on the biology of this tick, G. E. DAVIS (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 425-433).

Ornithodoros hermsi and relapsing fever in Oregon, G. E. DAVIS (*Pub. Health Rpts. [U. S.]*, 56 (1941), No. 41, pp. 2010-2012).

Examinations of wild animals for the cattle tick *Boophilus annulatus microplus* (Can.) in Florida, B. V. TRAVIS. (U. S. D. A.). (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 465-467).—The results of tick collections in the wild from four species of birds and nine species of mammals, made largely during the months of November to February, inclusive, in ticky areas of Orange, Osceola, and Collier Counties, Fla., are tabulated. Additional species of birds and species of mammals were examined, and no ticks found upon them.

The control of slugs by meta bait in Trinidad, B. W. I., E. M. CALLAN (*Trop. Agr. [Trinidad]*, 18 (1941), No. 11, pp. 211-213).—A bait consisting of a 2-percent mixture by weight of meta fuel, the main if not the only constituent of which is metaldehyde, a polymerized form of acetaldehyde, is extremely attractive and toxic to the slug *Vaginulus langsdorfi* Férussac but ineffective against the chunga. Applied in small heaps at the rate of 10 lb. of bait per acre, it proved effective in killing large numbers of slugs. Meta wheat bran bait proved to be more effective than meta baits with either rice bran or coconut meal as diluents, although, on a basis of cost, meta rice bran bait actually killed more slugs per dollar. Meta corn meal bait proved effective. Meta bait appears to retain its toxicity for about a week under Trinidad conditions. The cost of treatment varied from 53 to 78 ct. per acre, depending on the diluent used.

Haemonchus contortus eggs: Comparison of those in utero with those recovered from feces and a statistical method for identifying *H. contortus* eggs in mixed infections, J. H. TETLEY (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 453-463, figs. 8).

Spicule length in *Cooperia curticei* as a measure of favorable intestinal environment for this intestinal nematode of sheep, J. H. TETLEY (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 449-452).

ANIMAL PRODUCTION

War-time stock feeding—some investigations and lessons therefrom, W. G. R. PATERSON (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 53 (1941), pp. 26-48).—Results are presented of comparisons of silage and concentrates for beef and milk production, use of straw treated with caustic soda for beef production, and feed consumption of different breeds of sheep.

A method of determining range forage utilization by sheep, J. T. CASSADY (*Jour. Forestry*, 39 (1941), No. 8, pp. 667-671, figs. 2).—A description is given of a method for determining range forage utilization based on the percentage of the plants and parts of each species present before and after grazing. Each plant is arbitrarily divided into "units."

Recent work on the wool zoology of the New Zealand Romney, F. W. DRY (*New Zeal. Jour. Sci. and Technol.*, 23 (1940), No. 4A, pp. 209A-220A).—Recent developments and findings on inheritance of wool fiber character, halo-hair abundance, and kemp in the fleece of the New Zealand Romney are reviewed. Reference is made to the operation of multifactors in the halo-hair abundance and the relation to horn characters.

Swine feeding investigations, 1936 to 1940, C. E. AUBEL (*Kansas Sta. Cir.* 207 (1941), pp. 20, fig. 1).—A series of swine feeding experiments conducted from 1936 to 1940 deals with the relative value of the protein supplements and mixtures, corn v. blackstrap molasses for fattening pigs in dry lot on alfalfa pasture, and self-feeding and hand-feeding of sows with their litters. In general, peanut meal, soybean meal, and fish meal with minerals made satisfactory substitutes for tankage in the corn ration, but the amounts of feed required per unit of gain were often greater. Molasses successfully replaced corn, but feed costs were greater. Hand-feeding produced pork at a slightly more economical feed requirement than self-feeding.

The vitamin D requirements of the growing pig, B. J. SENIOR (*Roy. Dublin Soc. Sci. Proc.*, n. ser., 22 (1941), No. 38, pp. 379-385).—The potency of excess vitamin D in compensating a variable Ca:P ratio in the ration of pigs was demonstrated. The serum Ca was maintained at a relatively uniform level of from 10 to 11 mg. per 100 cc. on rations containing Ca:P ratios of 0.5 to 2, if adequate amounts of vitamin D were supplied by cod-liver oil and ample direct sunlight. In two experiments the sources of vitamin D were limited, and rickets developed in from 20 to 131 days.

The causes of stillbirth in swine and an attempt to control it, S. A. ASDELL and J. P. WILLMAN. ([N. Y.] Cornell Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 63 (1941), No. 6, pp. 345-353, fig. 1).—Among 1,882 pigs of three breeds born at the station from 1930 to 1935, 125 were dead. Study of the occurrence of stillbirths showed that disproportionate organ weights and pathological conditions seemed to be the principal contributory factors to the 6.6 percent of stillbirths. A considerable number of still-born pigs had attempted to breathe but had been smothered. Being born late in the farrowing seemed conducive to stillbirths. Tabulation showed that still-born pigs were more frequent in large litters, in the litters of old sows, and in spring litters than in small litters, in litters of young sows, and in fall litters, respectively. Hastening birth with pituitrin gave dubious results as to effects on stillbirths.

Effect of temperature and humidity on colour of lean and development of rancidity in the fat of pork during frozen storage, W. H. COOK and W. H. WHITE (*Canad. Jour. Res.*, 19 (1941), No. 2, Sect. D, pp. 53-60).—Storage of prime pork cuts in desiccators at temperatures ranging from -6.6° to -23° C. for 48 weeks showed that storage temperature was the primary factor affecting color. Samples that exhibited the greatest color change in storage showed the

least change on subsequent exposure. The brightness of exposed surfaces increased during storage at -6.6° , remained constant at -12.2° , and darkened at lower storage temperatures. Methemoglobin formation caused these changes. Storage temperature was an important factor influencing peroxide oxygen and free fatty acid increases. Spoilage of pork fat cannot be avoided in 1-yr. storage periods unless the temperature is -18° or lower.

Canadian Wiltshire bacon, XII-XIX (*Canad. Jour. Res.*, 18 (1940), Sect. D. No. 8, pp. 289-299, 300-304; 19 (1941). Sect. D, Nos. 1, pp. 22-27, figs. 2; 2, pp. 61-74, figs. 5; 3, pp. 85-95, 96-103, 104-111, figs. 2; 6, pp. 157-176).—Eight papers are presented in continuation of this series (E. S. R., 84, p. 379).

XII. *Effect of heat treatment on the colour and colour stability of bacon*, C. A. Winkler and J. W. Hopkins.—Interacting effects of time and temperature of heating on color of bacon were demonstrated. At 40° and 50° C., total intensity of color increased with the duration of heating, with no definite trend at 60° and 70° and a decrease in intensity at 80° . Duration of previous heating after 12 hours' exposure influenced the subsequent decrease in intensity after 96 hr. The decrease in intensity of green color was related to the duration, rather than the temperature, of heat treatment. The effects of duration of heating on red and blue stability at 12 to 20 hr. were replaced by temperature effects. Increased nitrite content of the meat after heating was negatively associated with intensity of color. It was noted that nitrite content and loss in weight on heating were correlated with increased color stability. These results were based on color determinations with the photoelectric comparator in 96 samples subjected to the different treatments.

XIII. *Tenderness of bacon and effect of heat treatment on tenderness*, C. A. Winkler and J. W. Hopkins.—Statistical samples from 22 packing plants indicated a significant influence of pH of both pump and cover pickle, number of "stitches," and duration of curing on tenderness. This characteristic of the bacon was not related to the salt, moisture, or nitrate content of the meat. Toughness increased with heating at from 20° to 50° C., but decreased at temperatures of from 60° to 80° . The maximum toughness was attained after heating at 50° .

XIV. *Seasonal variations in colour and colour stability*, C. A. Winkler, W. H. Cook, E. A. Rooke, and A. E. Chadderton.—Measurements of color and color stability of bacon cured in a factory producing a satisfactory product showed small but significant differences from time to time, but they were not attributed to seasonal effects.

XV. *Quantitative bacteriological and chemical changes in tank pickle and on bacon during cure and maturation*, N. E. Gibbons and W. H. White.—Settling of bacteria from the pickle was not responsible for the increased number of bacteria observed on the surfaces of sides during cure. Wiping tended to reduce the numbers of bacteria on the sides more than settling or washing. The concentration of salt, nitrate, and nitrite decreased rapidly during the first 12-24 hr. of cure in a commercial plant. Although some stratification of solutions occurred in the brine, it had little or no effect on the bacon. Bacterial and chemical changes in the pickle during cure were not related.

XVI. *Colour and colour stability of pork after frozen storage and conversion to bacon*, W. H. Cook.—Storing full-length rib-in pork backs at temperatures from -6.6° to -29° C. under different conditions showed the best color to be retained with storage below -17.7° , with impermeable wrappings. The lighter color of pork thawed in water or air instead of brine was markedly reduced after curing, although these colors were correlated. Color differences due to treatments were smaller at low than at high temperatures. Samples stored

under conditions that retained the original color or that produced light colors on thawing were least stable after defrosting.

XVII. Rancidity in pork fat after frozen storage and conversion to bacon, W. H. White.—Temperature, method of wrapping, and stage in the conversion to bacon were the most important factors governing the peroxide oxygen and free fatty acid contents of the fat of pork. The most effective conditions for retarding rancidity were storage at -18° to -23° C., with wrapping in aluminum foil followed by thawing in brine or pickle. Smoking had greater anti-oxidant effect on fat than pale-drying. Spoilage of pork or bacon fat was primarily due to oxidation.

XVIII. Effect of temperature and bacterial growth on nitrite content, W. H. White and N. E. Gibbons.—Samples of bacon with high and low bacterial populations by scraping and scrubbing were held at temperatures of 4° , 21° , 38° , and 55° C. for 20, 40, 80, and 160 hr. Both the total number of organisms and the number capable of reducing nitrate to nitrite were significantly correlated with the nitrite content. Furthermore, the samples adjusted to the high bacterial level usually contained more nitrite after treatment than those from the same hog but containing fewer bacteria. The increase in nitrite at temperatures below 55° was attributable primarily to bacterial growth and not to enzymes or other constituents of the bacon.

XIX. Comparative flavour tests on Canadian and Danish bacons, C. A. Winkler and W. H. Cook.—Tests of the comparative flavor of bacon samples by jury groups and canteens in different English areas showed Danish bacon to be superior in both pale and smoked conditions to Canadian bacon. Inferiority of the pale bacon was exaggerated by smoking. Better curing and transportation practices developed in Canada permitted delivery to the consumer in England of a generally satisfactory product. The principal complaint of Canadian bacon was excessive saltiness. Analysis of the palatability and quality reported of the representative samples were made by variance.

Studies on the energy expended by a horse at work, E. G. RITZMAN (*New Hampshire Sta. Bul.* 330 (1941), pp. 26-27).—Data on the relation of load drawn and variations in distance to energy expended by a work horse are briefly presented.

The nutritional requirements of dogs, C. M. McCAY. (Cornell Univ.). (*Cornell Vet.*, 31 (1941), No. 2, pp. 160-169).—A discussion is presented of the protein and vitamin needs of dogs, with comparison of the needs of the rat and man.

Known vitamins and their functions in canine metabolism, H. E. ROBINSON and L. D. FREDERICK (*Canad. Jour. Compar. Med. and Vet. Sci.*, 5 (1941), No. 10, pp. 288-291).—A discussion of the quantitative requirements of dogs for the vitamins is given.

Vitamin A deficiency in silver foxes, S. E. SMITH. (U. S. D. A. coop. Cornell Univ. et al.). (*Amer. Fur Breeder*, 14 (1941), No. 3, pp. 10, 12, figs. 2).—Six fox pups nursed by a vixen on a low-vitamin A diet developed nervous symptoms, starting with a trembling of the head, in about 4 weeks. Finally, typical xerophthalmia and histological changes in the tissues developed at 18, 25, and 27 weeks in different pups. A complete cure of the head trembling of one pup by large doses of pure vitamin A was effected. Growth rate did not suffer from the A deficiency, but one pregnant ♀ aborted at 43 days. No vitamin A was chemically detectable in the livers of the deficient foxes.

Progress report on the feeding of soybean oilmeal to foxes, C. F. BASSETT (*Amer. Fur Breeder*, 14 (1941), No. 3, pp. 22-24).—Rations containing soybean meal, beef meal, and liver meal were found satisfactory for adult foxes and

weaned pups. Foxes fed a ration with a total of 12 percent from these sources were superior in growth, fur development, sheen, and absence of tinge to pelts of other foxes fed rations containing 40 percent of raw meat. There was little difference in the soybean meals, but pelts from pups receiving hydraulic-pressure and expeller soybean meals were considered superior to pelts of pups receiving solvent-process meal. These feeding investigations were conducted with 19, 30, and 32 foxes on the soybean supplement and the meat rations each year from 1933 to 1940.

Digestibility studies with foxes, I, II (*Sci. Agr.*, 22 (1941), No. 1, pp. 18-39, fig. 1).—Two studies are reported in this series based on variance analyses with four animals in successive periods.

I. *Effect of the plane of nutrition upon the digestibility of meats*, W. R. Inman and G. E. Smith (pp. 18-32).—The digestibility of fresh and frozen beef and frozen horse meat was not affected in foxes by the plane of nutrition in which 280, 340, 400, or 460 gm. was fed per day. The data were analyzed and showed that the frozen horse meat gave the lowest values of all nutrients.

II. *Digestibility of frozen beef tripe, frozen lip meat, frozen beef hearts, and frozen cow udders*, W. R. Inman (pp. 33-39).—Lip meat and beef heart were better utilized than tripe for digestibility of dry matter, organic matter, N, and fat. Udder tissue was of low value for N utilization, but tripe was low for utilization of fat.

[**Poultry studies in New Hampshire**] (*New Hampshire Sta. Bul.* 330 (1941), pp. 39-40).—Studies are noted by R. C. Durgin, T. B. Charles, S. R. Shimer, and H. A. Davis on the protein requirements of chickens, and by Charles, Durgin, and W. T. Ackerman on moisture in peat litter.

A second poultry survey in Kansas, L. F. PAYNE (*Kansas Sta. Bul.* 297 (1941), pp. 56, figs. 12).—A repetition in 1940 of the 1926 survey of poultry production in Kansas (E. S. R., 59, p. 165) showed that, although there have been many changes and improvements in the 14 yr., further progress may be made, particularly in more poultry enterprises and fewer poultry side lines on farms. Possibilities of a wider place for poultry are mentioned.

Intensity of fall and winter egg production of pullet progeny sired by cockerels sib-tested for intensity of production, A. E. TOMHAYE (*Delaware Sta. Bul.* 232 (1941), pp. 27, figs. 4).—Four years' trials were conducted in comparing the fall and winter production of daughters of sires selected because of the high or low production of their full sisters. In all of the four experiments, larger percentages of the pullet progeny of the sires selected for the high intensity of production of their sisters had high average intensity than the progeny of sires selected on the opposite basis. Among the daughters of sires selected because of the higher production of their sisters there were 56.9 percent producing over 70 percent and only 43.1 percent below 70 percent. In the daughters of sires selected for low intensity of production of their sisters, only 36 percent produced more than 70 percent and 64 percent were below 70 percent in production. These results are considered to indicate definitely that the hens used in the breeding pens were not responsible for the differences in intensity.

The results were accomplished by making up the breeding pens with comparable dams each year. The intensity records of production of the sire's sisters seemed a better indication of the production of his pullet progeny than similar records on the sire's and dam's ancestors or on the dam herself. These conclusions were based on production records of 232 daughters of 4 sires in the high lines and 175 daughters of an equal number of sires in the low lines.

Clutch length in relation to period of illumination in the domestic fowl, T. C. BYERLY and O. K. MOORE. (Univ. Md.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 387-390).—Data on production by pullet and laying hens show conclusively that it was possible to lengthen the clutch by synchronizing the dark and light periods to which the hen was exposed. Rate of production was increased in the 26-hr. day (14 hr. of light and 12 hr. of darkness), as contrasted with continuous lighting or shorter periods of lighting. Slightly more than 60 percent of the eggs laid by the group with 14 hr. of light and 12 hr. of darkness were laid in the dark, and this period proved somewhat more satisfactory by prolonging cycles without causing refractoriness. Ovulation and light stimulation of the pituitary usually followed soon after laying.

Factors affecting the duration of the first annual rest, I. M. LERNER and L. W. TAYLOR. (Univ. Calif.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 490-495, fig. 1).—Single, partial, and multiple correlations in 289 Single-Comb White Leghorns showed persistency, as measured by date of or age at last egg before the fall rest, to be most closely correlated (about 0.5) with the duration of rest of any of the factors studied. By association with persistency other factors, such as length of laying year and annual egg production, showed correlation with duration of rest period. Winter rate by correlation with annual egg production was correlated with the length of annual rest period. Eighty-eight percent of the birds began their rest period when the length of day was decreasing, but an association could not be established with day length. However, some seasonal effects of the rest period were indicated.

Accuracy of short-interval trap-nesting of the fowl, E. E. SCHNETZLER (Ind. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 551-555).—Study of the annual egg production records of 380 hens and estimates of the production from trap-nesting 1, 2, 3, 4, 5, or 6 days per week or 6 consecutive days in alternate weeks showed that poultry breeders may obtain a satisfactory estimate of the annual record from either 4, 5, or 6 days per week of trap-nesting. There was only one hen in which estimates from records on 6 days per week differed by more than 10 eggs from the actual record, but the errors were greater with less frequent trapping. The accuracy of the various short-interval periods of trap-nesting as estimates of annual production was essentially the same for 83 hens in the second laying year as for the first year's production.

Relations of weights and volumes of eggs to measurements of long and short axes, W. D. BATEN and E. W. HENDERSON. (Mich. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 556-564, figs. 5).—Formulas for estimating the weights and volumes of 51 Single-Comb White Leghorn and 53 Barred Plymouth Rock eggs with the long and short axes of the egg are presented. The volume of eggs of either breed could be predicted very accurately by using both long and short axes. The density of eggs of both breeds was 1.07, and the volume could be estimated as 0.933 times the weight. The surface was computed from an ellipsoid.

Effect of colored light and colored walls on the growth and mortality of chickens, J. C. HAMMOND and H. W. TRTUS. (U. S. D. A.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 507-513).—Growth and development of 3,760 chicks were observed for 4 and 12 weeks in rooms in which the ceilings and walls were painted white, violet blue, black, gray, yellowish green, red, and red and dark green. From the results it became apparent that light intensity was more important than the color of the light. Chicks in a low light intensity did not learn readily to eat, and some never learned. In the black, blue, red, and red-and-green pens, relatively little light was reflected and initial mortality was high. Colors of high reflectivity were favorable to growth, but after chicks

were taught to eat they also grew well in low light intensity. Neither the color nor the intensity of light to which the pullets were exposed during the first 16 weeks of their life affected live weight, egg production, or fertility or hatchability of the eggs.

Protein requirements of chickens at various stages of growth and development, II, A. E. TEPPER, R. C. DUBGIN, T. B. CHARLES, S. R. SHIMER, and H. A. DAVIS (*New Hampshire Sta. Bul. 335 (1941), pp. 15*).—The protein requirements of floor-managed New Hampshires fed rations containing 15, 17, and 19 percent of protein from meat scrap, fish meal, dried skim milk, and mixtures of all three were somewhat different from those for cage-managed birds, as reported in a previous bulletin (E. S. R., 81, p. 694). The most rapid gains were made on the higher protein levels. The mixture of three animal protein sources was more desirable from the standpoint of growth, efficiency of feed utilization, production, laying-house mortality, hatchability of eggs, and control of gizzard lesions in the chicks than any one animal protein concentrate.

The effect of increased pantothenic acid in the egg on the development of the chick embryo, A. TAYLOR, J. THACKER, and D. PENNINGTON (*Science, 94 (1941), No. 2449, pp. 542-543*).—A relatively high level of pantothenic acid in the egg was associated with improved hatchability and increased hemoglobin concentration in the blood during incubation of the developing embryos. A low concentration of pantothenic acid was associated with a larger than normal brain, while both heart and brain were depressed in relative size in embryos from the eggs with higher levels of pantothenic acid. The study was conducted on incubating eggs injected with pantothenic acid and on eggs from hens on high pantothenic acid rations.

The vitamin A reserve of diseased fowls, V. B. HOLLAND, G. H. SATTERFIELD, H. C. GAUGER, A. D. HOLMES, and F. TRIPP. (Univ. N. C. et al.). (*Poultry Sci., 20 (1941), No. 6, pp. 543-550*).—Quantitative determinations of Lovibond blue and yellow units of the vitamin A and carotene in the livers of 85 birds with various diseases submitted from different places for autopsy show wide ranges. Therefore it was not possible to correlate a specific avian disease or parasitic infestation with the vitamin A or carotene stores in the liver.

Feeding values of low- and high-test weight grains for chickens, W. E. POLEY and W. O. WILSON (*South Dakota Sta. Bul. 353 (1941), pp. 32, figs. 2*).—These studies were conducted from 1937 to 1940 with corn, wheat, and barley ranging in weight per bushel from 49.5 to 56, 42 to 58.5, and 31 to 50 lb., respectively. In each case the light or heavy grade of the cereal grain, ground or whole, was added to both the mash and scratch. Similar amounts of heavy, medium, and light grades of corn, wheat, and barley were required for starting, growth, and egg production. Small variations in the rapidity of growth, production, and hatchability were noted.

Corn distillers' dried grains with solubles in poultry rations, I, II. (Mass. Expt. Sta. et al.). (*Poultry Sci., 20 (1941), No. 6, pp. 527-535, figs. 5; pp. 536-542, figs. 4*).—Two papers in this series on corn distillers' grains for chicks and laying hens are presented.

I. Chick rations, K. G. Shea, C. R. Fellers, and R. T. Parkhurst.—When corn distillers' dried grains were fed to rats as the sole source of protein the growth rate was much retarded, but normal growth resulted when 25 percent of the protein was derived from the corn distillers' grains. Satisfactory growth up to 8 or 10 weeks was obtained in White Leghorn and crossbred chicks when dried grains replaced all of the dried skim milk and 50 percent of the soybean meal in the New England Conference chick ration if the protein content remained the same, but it was not possible to substitute successfully grains for 50 percent

of the meat scrap and fish meal. Substitution for a large portion of the alfalfa meal was less satisfactory. The substitutions for the fish meal or dried skim milk resulted in slightly better feather development and fleshing. The dried corn distillers' grain slightly improved the leg coloring produced with dried skim milk. The corn distillers' dried grains with solubles constituted an excellent source of riboflavin and thiamin, and the protein was of good supplementary quality. There were also present in the corn distillers' dried grains small amounts of vitamins A, D, and E and pantothenic acid. In this study, pens of 50 chicks were used in tests of each ration.

II. *Laying rations*, F. L. Dickens, R. T. Parkhurst, and C. R. Fellers.—Corn distillers' dried grains with solubles satisfactorily replaced dried skim milk and fish meal and part of the meat scraps in the New England Conference laying ration, provided the protein content was not altered. The corn distillers' dried grains with solubles used were the residue that remained after extraction of alcohol and distilled liquors from corn or a mixture of grains. The thin slop containing yeasts, lactic acid, and soluble solids was included. Egg production, egg weight, body weight, egg quality, and feed efficiency were comparable in all of the 8 lots of 22 Single-Comb Rhode Island Reds fed in the study over a period of 1 yr. Fertility and hatchability of the eggs, however, were reduced somewhat with the substitution of the distillers' grains for the animal proteins.

Weight and quality of the yolks of eggs of chickens fed diets containing vegetable oils, B. W. HEYWANG and H. W. TRUS. (U. S. D. A.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 483-489).—Eggs of eight groups of pullets fed for 98 days on a low-fat ration to which 4 percent of coconut oil, palm oil, peanut oil, cottonseed oil, soybean oil, or hempseed oil was added or on a normal or low-fat basal mash showed no significant differences in yolk weight, ratio of egg weight to yolk weight, or yolk index when fresh or after 6 mo. of storage. However, the yolks from the group on cottonseed oil deteriorated in storage, and it was possible to obtain height and diameter measurements on only a few of them. Except for the eggs from the cottonseed oil group, there was no difference in mottling of yolks after storage. Egg production and gains in live weight in the different groups were similar. Evidently laying hens on low-fat rations can produce yolks of average size or quality. No significant differences were found between the group that received the low-fat rations and those with oil supplements.

Japanese tendergreen mustard, Italian rye grass, and oats as a source of green feed for laying hens, G. R. SIRE and H. D. POLK. (Miss. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 5, pp. 406-412).—Grazing crops reduced the feed requirement for egg production from approximately 6 to 10 percent and lowered mortality, but there was no influence on hatchability. The yolks of eggs produced by hens on pasture crops were darker than yolks of eggs laid by birds on dry rations. In each of 4 yr., groups of 25 hens or pullets on a cereal ration with fish meal were given access in different lots to mustard, oats, and ryegrass pasture. The number of days of grazing on ryegrass were greater in the winter and spring months and throughout the year, with oats second and mustard last, but for summer grazing mustard was best. The amounts of feed per dozen eggs with the different grazing crops were oats 6.27 lb., mustard 6.41, and ryegrass 6.58 lb. In dry-lot feeding 6.98 lb. of feed were required per dozen of eggs.

Effects of sulphur on growing chickens, D. J. CARRERA (*Philippine Jour. Anim. Indus.*, 8 (1941), No. 2, pp. 89-97).—Four experiments demonstrated that continuous feeding of flowers of sulfur added at the rate of 2.64 percent to the mash of chicks exerted a deleterious effect on growth. The sulfur was better tolerated by 8-week-old than by 3-week-old chicks.

The effect of the level of vitamin D on egg production and hatchability of Bronze turkey hens, L. A. WILHELM, E. I. ROBERTSON, and M. RHIAN.

(Wash. Expt. Sta.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 565-569, figs. 2).—When no vitamin D was added to the rations of turkey hens confined without access to sunlight, egg production and hatchability were very low and egg production ceased after 48 days. There was no benefit in egg production or hatchability from additions of more than 100 A. O. A. C. chick units of vitamin D in cod-liver oil per 100 gm. of a ration including a variety of feeds. The largest eggs were produced by hens receiving 400 units of vitamin D. Soft-shelled eggs were less frequent with more than 200 units of vitamin D, but shell spotting was not so prevalent with rations containing less than 200 units.

These results were obtained with four groups of Bronze turkeys deprived of vitamin D. The experiment started on December 20 by the addition of 0, 100, 200, and 400 A. O. A. C. chick units of vitamin D in cod-liver oil per 100 gm. of feed. In a second part of the experiment, when the ration of the group receiving no cod-liver oil was supplemented with 200 units of vitamin D and given access to sunlight, egg production and hatchability were rapidly restored. There was no deleterious effect or shell spotting from excessive amounts of vitamin D.

Salt tolerance of turkey poults, J. O. FOSS (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 1, p. 7).—Turkeys were found susceptible to over 4 percent of salt in the ration.

A study of turkey curing and smoking, A. K. BESLEY and S. J. MARSDEN. (U. S. D. A.). (*Poultry Sci.*, 20 (1941), No. 6, pp. 496-506, figs. 2).—Turkeys were covered with brine and cured for from 1 to 4 weeks, followed by smoking. A satisfactorily cured turkey was produced in a curing period of from 2 to 3 weeks. Removal of the leg tendons aided penetration of the curing medium. Smoking for 16 hr. at 140° F. gave a more attractive color than 20 hr. at 110°. Analyses of the meat led to the conclusion that salt entered the breast and thigh muscles through channels other than the skin, probably from the body cavity.

DAIRY FARMING—DAIRYING

[Investigations in dairying in the Southern States] (*Assoc. South. Agr. Workers Proc.*, 42 (1941), pp. 87-88, 89-90, 121-126, 133-134, 134-135, 136-137, 138-139, 139-141).—Abstracts of the following papers are listed in these proceedings: Summary of Barn Hay-Curing Activities, by J. A. Schaller (pp. 87-88); The Georgia Studies of Barn-Dried Hay, by W. E. Hudson (p. 89) (Univ. Ga.); Feeding Studies of Barn-Dried Hay Versus Field-Dried Hay, by C. E. Wylie and S. A. Hinton (p. 90) (Tenn. Expt. Sta.); Virginia Studies of Barn Hay-Drying, by J. W. Sjogren and P. D. Rodgers (p. 90) (Va. A. and M. Col.); The Place of Dairying in the Southern Farm Program, by C. N. Shepardson (pp. 121-123) (Tex. A. and M. Col.); Development of Outlets for Southern Milk Products, by C. W. Holdaway (p. 123) (Va. A. and M. Col.); Correlating the Dairy Program With the Programs of Other Educational and Regulatory Agencies in Southern Agriculture, by C. G. Cushman (pp. 123-126) (Clemson Agr. Col.); Organizing Artificial Insemination Associations, by C. A. Hutton (pp. 133-134) (Univ. Tenn.); Age of Bulls for Artificial Insemination Associations, by R. G. Connelly (pp. 134-135) (Va. A. and M. Col.); Recent Observations on Cream Used for Making Butter in the South, by E. L. Fouts (pp. 136-137) (Univ. Fla.); Relative Fertility of Dairy Animals, by L. P. La-Master (p. 138) (Clemson Agr. Col.); Feeding Clover-Molasses Silage, by A. D. Pratt (pp. 138-139) (Va. Expt. Sta.); Legume Silage for Dairy Cows, by C. E. Wylie and S. A. Hinton (pp. 139-140) (Univ. Tenn.); Feeding Hay With Pasture, by C. H. Staples (p. 140) (La. State Univ.); The Ascorbic Acid Content of

Milk as Affected by Varying Amounts of Shark Liver Oil in the Ration, by H. E. Skipper, I. I. Rusoff, and L. M. Thurston (p. 140) (Fla. Expt. Sta.); and Persistency of Lactation in Relation to Milk Production, by D. W. Colvard (pp. 140-141) (N. C. Expt. Sta.).

[Dairying investigations at the New Hampshire Station] (*New Hampshire Sta. Bul.* 330 (1941), pp. 26, 33-35).—Brief progress reports (E. S. R., 83, p. 814) are presented for studies on the protein requirements for growth of dairy heifers and their rate of metabolism at various ages, by E. G. Ritzman and N. F. Colovos; a comparison of dry-feed systems for raising dairy calves and the economy of raising dairy replacements under New Hampshire conditions, both by K. S. Morrow; and variability in the solids-not-fat content of milk as influenced by heredity, by H. C. Moore and Morrow.

[Investigations with dairy cattle and dairy products in Vermont] (*Vermont Sta. Bul.* 475 (1941), pp. 22-28).—Progress results (E. S. R., 84, p. 235) are presented for the following lines of investigation by H. B. Ellenberger: The effect of feeding vitamins A and D in concentrated cod-liver oil with different grades of hay to dairy calves, the conservation of nutrients in grasses and legumes as hay and as silage, the artificial insemination of dairy cows, the relation of ascorbic acid and oxygen to the oxidized flavor of milk, temperature changes occurring in cans of milk while awaiting and during transportation, accounting for milk fat in dairy plants, factors other than bacterial metabolic activity affecting the rate of dye reduction in milk, factors to be considered in the laboratory pasteurization of milk, and pH changes in stored media.

The improvement of a Holstein-Friesian herd through the use of sires with superior pedigrees: The first twenty years, 1920-1940, T. A. BAKER and A. E. TOMHAVE (*Delaware Sta. Bul.* 231 (1941), pp. 23, figs. 8).—This bulletin presents a summary of the production records of the group of cows assembled as a foundation herd in 1919 and the dam-daughter comparisons for the six herd sires, all selected as young unproved bulls, used in this herd during the ensuing 20-yr. period. With one exception, the daughters of these sires excelled their dams in average butterfat production, which has resulted in a rather steady increase in the average production level of the herd. Daughters of the last two bulls used produced on the average 35 percent more butterfat per year than the foundation cows, and it appeared that hereditary factors tending toward very low production had been eliminated from the germ plasm of the herd.

Grasses [and] legumes join corn [and] sorghum as silage material: Silage urged for dairy cows, W. C. COWSEET (*Miss. Farm Res.* [*Mississippi Sta.*], 4 (1941), No. 9, pp. 1, 2).—Practical suggestions are offered on the ensiling of grasses and legumes and the inclusion of various types of silage in the dairy ration. Records on the hay and silage consumption when 8 lb. of Johnson grass hay and 30 lb. of sorghum silage per cow daily were fed showed a refusal of 25.86 and 0.32 percent of the hay and silage, respectively. When 8 lb. of lespedeza hay and 30 lb. of sorghum silage were fed, 11.41 and 1.87 percent of hay and silage, respectively, were refused.

The physiological effect of molasses- and phosphoric acid-alfalfa silages on the dairy cow, W. A. KING and W. C. RUSSELL. (N. J. Expt. Stas. and Rutgers Univ.). (*Amer. Chem. Soc. Mtg.*, 102 (1941), *Abstr. Papers*, p. A21).—In a continuous feeding trial of 20 weeks' duration, four comparable groups of three cows each received (1) molasses-alfalfa silage only, (2) molasses-alfalfa silage, grain, and hay, (3) phosphoric acid-alfalfa silage only, and (4) phosphoric acid-alfalfa silage, grain, and hay. The serum calcium levels of all cows remained quite constant throughout the experiment. The cows receiving

the phosphoric acid silage showed increased levels of inorganic phosphorus of the plasma, a decrease in CO_2 -combining power of the plasma, and sharp variations in the pH and ammonia content of the urine. In several periods urine pH was as low as 5.45, and the urinary ammonia as high as 1,300 mg. per 24 hr. Cows receiving hay and grain with the phosphoric acid silage showed less marked variations in these characters than those receiving the silage alone. Cows receiving the molasses-alfalfa silage remained normal throughout.

The content of grass-juice factor in legume silages and in milk produced therefrom, B. C. JOHNSON, C. A. ELVEHJEM, and W. H. PETERSON. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 861-864, fig. 1).—Extending this line of investigation (E. S. R., 82, p. 662), additional evidence was secured to indicate that the grass-juice factor of forages is well preserved in silage, although the extent of preservation varied with different methods of ensiling. Silages prepared with phosphoric acid were richer in this factor than those from comparable materials treated with molasses or untreated. Alfalfa silage preserved with soured whey concentrate showed excellent preservation of this factor. The concentration of the grass-juice factor in various silages was directly reflected in the potency of this factor in winter milk when the various silages were fed to cows.

Rumen synthesis of the vitamin B complex on natural rations, M. I. WEGNER, A. N. BOOTH, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 1, pp. 90-94).—Experiments were conducted similarly to those previously reported (E. S. R., 84, p. 807), except that rations composed of natural feeds were used instead of a synthetic diet. The experimental subject was a Holstein heifer weighing about 1,000 lb., with a rumen fistula. In each of six experiments comparative values were obtained for the amounts of thiamin, riboflavin, pyridoxin, pantothenic acid, nicotinic acid, and biotin in the feed and in the rumen content. In practically all cases higher values were found in the rumen ingesta, indicating that synthesis of these factors had occurred. With the exception of flavin, variations in the amount of protein or urea in the ration exerted little, if any, effect on the vitamin content of the ingesta.

The utilization of urea by ruminants as influenced by the level of protein in the ration, M. I. WEGNER, A. N. BOOTH, G. BOHSTEDT, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 835-844, figs. 9).—Continuing this line of investigation (E. S. R., 85, p. 100), the ammonia, nonprotein nitrogen, total nitrogen, and dry matter in the rumen content of a Holstein heifer were determined at frequent intervals after the feeding of experimental rations which were constant except for the levels of linseed meal and urea contained in the concentrate mixture. In three series of experiments, in which (1) rates of linseed meal and of urea were simultaneously increased, (2) rates of linseed meal were successively increased with urea content held constant, and (3) urea levels were successively increased without the addition of linseed meal, as the level of protein in the concentrate mixture increased from the basic level of 11.3 to 24 percent the protein content of the rumen ingesta showed a marked increase. The rate of conversion of urea nitrogen to protein in the rumen, however, decreased as the protein level of the rumen ingesta became greater than 12 percent. When the level of protein in the concentrate fed was increased to more than 18 percent, not only the rate, but also the extent, of conversion of urea nitrogen to protein began to decrease. When no linseed meal was added to the basal mixture, the added urea was completely utilized up to a level of 4.5 percent (protein equivalent of 12 percent) of the grain mixture.

Studies on pituitary lactogenic hormone, V, VI. C. H. LI, W. R. LYONS, and H. M. EVANS. (Univ. Calif.). (*Jour. Biol. Chem.*, 139 (1941), No. 1, pp. 43-55, figs. 2; 140 (1941), No. 1, pp. 43-53, figs. 2).—Two papers are presented in continuation of this series (*E. S. R.*, 85, p. 607).

V. Reactions with iodine.—In an effort to detect "functional" molecular groupings, this study was directed toward determining the effect on biological activity of specific modifications of the molecule. The hormone was iodinated by reaction with iodine for 1 hr. at room temperature in weakly alkaline, buffered solution. The resulting product, separated and purified by dialysis, was almost completely inactive. Analytical values for the nitrogen, iodine, and tyrosine content suggested that the iodine had reacted only with the tyrosine portion of the molecule. This was further borne out by a comparative study of the reactions of iodine with the hormone and with pure tyrosine in different solvents and at varied pH. Data on the rate of reaction suggested that some tyrosine groups of the hormone had reacted with iodine at the same rate as pure tyrosine, whereas other tyrosine groups had reacted more slowly. At pH 3.8 or lower there was no reaction between iodine and the hormone, indicating, thus, the absence of cysteine or —SH groups, which characteristically react with iodine in acid solution. The isoelectric point of the iodinated hormone shifted from pH 5.8 to about pH 4.7.

VI. Molecular weight of the pure hormone.—The molecular weight of the lactogenic hormone was estimated by osmotic pressure measurement to be approximately 26,500. When the minimum in molecular weight of the lactogenic hormone was ascertained, estimations based on the tryptophan, tyrosine, cystine, arginine, and sulfur contents of the pure hormone indicated a molecular weight of approximately 25,000.

Influence of lactogenic preparations on production of traumatic placentoma in the rat. H. M. EVANS, M. E. SIMPSON, and W. R. LYONS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 4, pp. 586-590).—The purified lactogenic hormone, noted above, induced luteinization of hypophysectomized or immature ♀s to stimulate the production of traumatic placentomata. In mature ♀s, 1 mg. or more of the lactogenic hormone administered daily for 10 days produced placentomata in all of 8 animals tested, whereas 0.5-mg. doses were positive in 2 of 4 animals, and all of 13 were negative without any lactogen. Immature ♀s in which ovulation was induced by gonadotropin gave positive results with 0.1 mg. in all cases.

Effect of desoxycorticosterone on pituitary and lactogen content. C. W. TURNER and J. MEITES. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 232-234).—Injections of ♂ and ♀ guinea pigs for from 10 to 20 days with 7 to 20 mg. of desoxycorticosterone acetate daily stimulated growth of the mammary gland and increased pituitary weight, but there was no increase in the lactogen content of the pituitaries as determined in pigeon crop-gland tests. With oestrogen treatment for comparison there was at least a threefold increase in the lactogen content of the pituitary.

Growth of the lobule-alveolar system of the mammary gland with pregnenolone. J. P. MIXNER and C. W. TURNER. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 2, pp. 453-456).—Continuing these studies (*E. S. R.*, 84, p. 611), the authors found that the lobule-alveolar system of the mammary glands of castrate ♀ mice was stimulated by pregnenolone, alone and in combination with oestrone. This product was found to have a property similar to progesterone. In a comparison with progesterone it was found that the hyperemia of the genital tract caused by oestrogens probably stimulated the development of the lobule-alveolar tissue in the mouse. Preg

neninolone was estimated to have one-half the activity of progesterone in this respect.

Effect of stilboestrol on the mammary gland of the mouse, rat, rabbit, and goat, A. A. LEWIS and C. W. TURNER. (Mo. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 845-860, figs. 4).—Stilboestrol suspended in oil when injected into male mice for from 2 to 4 weeks at rates ranging from $\frac{1}{16}\gamma$ to $\frac{1}{2}\gamma$ per day, caused extensive mammary duct proliferation. Such treatments produced similar results in spayed virgin females, but approximately six times as great a dosage administered orally was required to produce comparable results. Mammary duct growth was also stimulated in castrated male rats by the subcutaneous injection of $\frac{1}{16}\gamma$ to 1γ of stilboestrol daily. Rats apparently required a higher dosage than did mice to stimulate duct growth. Both male and female rabbits responded readily to stilboestrol administered subcutaneously as pellet implantations, or by percutaneous application. The injection of 0.4γ per day produced extensive duct development in male rabbits, with evidence of early lobular development after 40 to 60 days' treatment. Well-developed duct systems grown with stilboestrol in male rabbits came into lactation upon the administration of lactogen. Copious milk secretion resulted from the injection of stilboestrol alone in a normal adult female rabbit. The subcutaneous injection of stilboestrol into virgin goats resulted in abundant and prolonged lactation, but little increase in the extent of the glands was apparent. Subcutaneous injection followed by pellet implantation in a castrated male goat failed to stimulate mammary gland development, although teat development was stimulated. It is suggested that failure may have been due to inadequate dosage.

[Abstracts of dissertations on dairy problems] (*Iowa State Col. Jour. Sci.*, 16 (1941), No. 1, pp. 75-79, 148-154).—Abstracts of the following doctoral theses pertaining to dairy problems are given: Distribution of Salt in Butter and Its Effect on Bacterial Action, by W. H. Hoecker (pp. 75-76); Relationship of the Lipolytic and Proteolytic Activities of Various Penicillia to the Ripening of Blue Cheese, by C. Jensen (pp. 77-79); The Effect of Soybeans and Soybean Oil on Milk and Butterfat Production and on the Quality of the Butterfat, by N. K. Williams (pp. 148-151); and Action of Mold Inhibitors on Dairy Products, by J. J. Willingham (pp. 152-154).

A new microscopic procedure for the detecting and locating of the source of thermoduric organisms in milk, W. L. MALLMANN, C. S. BRYAN, and W. K. Fox. (Mich. Expt. Sta. et al.). (*Jour. Milk Technol.*, 4 (1941), No. 4, pp. 195-199).—The proposed test consists in incubating from 5- to 10-cc. samples of suspected milk at from 58° to 60° C. for 2 hr., after which a microscopic count is made by the standard procedure. Samples showing bacterial counts of 40,000 or more per cubic centimeter are considered to contain thermoduric bacteria in excessive numbers. By applying this test to milk samples obtained from producers' supplies and at successive steps in the processing of milk or its products, the source of contamination may be located.

A new group of sterilizing agents for the food industries and a treatment for chronic mastitis, F. M. SCALES and M. KEMP (*Internat. Assoc. Milk Dealers, Assoc. Bul.* 19 (1941), pp. 491-520).—Extensive studies by the authors on various organic detergents or wetting agents have definitely confirmed their earlier findings that these compounds may possess strong germicidal qualities. These properties were most pronounced when the solutions were adjusted to a relatively low pH. Many of these wetting agents when adjusted to a pH of 4.0 were more strongly germicidal than the alkaline sodium hypochlorite solutions commonly used for sterilizing agents. Gluconic or phosphoric acids are recommended as acidifying agents because of their low corrosion properties. A con-

centration of 0.03 to 0.05 percent of the wetting agent when this is adjusted to pH 4 is recommended for general industrial use, although solutions of only 0.01 percent concentration gave good sterilization under carefully controlled conditions. Practical procedures are suggested for the sterilization of dairy farm utensils, the hot or cold sterilization of 10-gal. milk cans with nonporous surfaces, and for drinking glasses and utensils in public eating places. A treatment for chronic mastitis, using Zephiran as a germicide and Triton No. 720 as a dispersing agent, is proposed. This material, even when diluted with milk, completely destroyed a heavy inoculum of *Streptococcus agalactiae* within 3 min.

The relationship of pH to some curd characteristics of modified milks, A. B. STORRS (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 865-871, figs. 2).—Lots of commercially prepared milks, including (1) both raw and pasteurized normal milk, (2) homogenized milk, (3) enzyme-treated milk, (4) base-exchange milk, and (5) evaporated milk diluted 1:1 with water, were each divided into sub samples which were adjusted to pH levels of 6.0, 5.5, 5.0, 4.5, and 4.0. Each sample was then subjected to the Chambers-Wolman curd test. The curd surface area of any of the milks appeared to be lowest at the highest pH at which complete coagulation would occur. At any pH below that required for complete coagulation, the curd surface area increased as the pH was lowered. The effect of pH upon the completeness of curd formation varied considerably with the different processes involved, leading to the conclusion that there does not seem to be any single pH level suitable for comparative in vitro tests on all milks.

Rancidity studies on mixtures of raw and pasteurized homogenized milk, P. B. LARSEN, G. M. TROUT, and I. A. GOULD. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 9, pp. 771-778, figs. 3).—Continuing this line of investigation (E. S. R., 82, p. 529), experiments were conducted on mixtures composed of (1) unhomogenized raw and homogenized pasteurized milk, (2) homogenized raw and homogenized pasteurized milk, and (3) unhomogenized raw and homogenized raw milk. Rancidity and an increase in acidity invariably developed on storage when either homogenized or unhomogenized raw milk was mixed with homogenized pasteurized milk. The maximum increase in acidity occurred when the ratio of raw to homogenized pasteurized milk was approximately 1:1, regardless of whether the raw milk was homogenized or not, indicating that the amount of increased surface or increased surface activity caused by homogenization and the amount of lipase added by the raw milk are of about equal importance in the development of rancidity in homogenized milk.

Effect of certain factors upon lipolysis in homogenized raw milk and cream, I. A. GOULD. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 9, pp. 779-788, figs. 4).—Milk and cream separated and/or homogenized at 100° F., using homogenization pressures of 500 to 1,000 lb., were employed in these experiments. When copper was added to milk in concentrations up to 10 p. p. m., either prior to or subsequent to homogenization, it had no significant influence on the extent of lipolysis. The addition of sodium chloride to cream obtained from homogenized milk markedly retarded the rate of lipolysis, a concentration of 8 percent practically inhibiting this reaction. The addition of formalin to cream from homogenized milk had little or no influence on the rate of fat splitting in the cream. Lipase activity in the homogenized cream was found to vary directly with storage temperature, the amount of free fatty acids practically doubling as temperature increased of 0° to 35° and increasing twelvefold from 0° to 70°. Studies with homogenized remade milk from cream and skim milk gave evidence that the active lipase is contained in the plasma fraction of the milk. Frac-

tionation of the plasma indicated that a considerable portion of the lipolytic activity of the milk is removed with the casein, although some occurred in the whey fraction. Evidence was secured also to indicate that lipolysis in homogenized raw milk proceeds independently of oxidative changes in the fat. It is concluded that lipolysis in homogenized raw milk is not affected, in all cases, by the same factors which have been found to influence the rate of fat splitting in normal milk. Whether these variations are due to different lipases or whether merely due to physical or physicochemical changes involving the fat globules has yet to be definitely determined.

Oxidation-reduction potentials and the oxidized flavor in homogenized milk, P. B. LARSEN, I. A. GOULD, and G. M. TROUT. (Mich. Expt. Sta.). (*Jour. Dairy Sci.*, 24 (1941), No. 9, pp. 789-793, figs. 2).—Milks normally susceptible to oxidized flavor development and nonsusceptible milks contaminated with 1 or 3 p. p. m. of copper were included in these studies. In all cases the oxidation-reduction potential was similar in homogenized and unhomogenized milks. Homogenization at 2500 lb. stabilized the susceptible milk and also the nonsusceptible milk containing 1 p. p. m. of copper against oxidized flavor development during a 10-day holding period, but failed to protect entirely the milk to which 3 p. p. m. of copper was added. Thus it appeared that the mechanism by which homogenization protects or retards oxidized flavor development is independent of oxidation-reduction potentials.

The production and use of concentrated skim milk foam, B. H. WEBB. (U. S. D. A.). (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 829-834, fig. 1).—Whipping tests with a number of reconstituted dried skim milks and condensed skim milks revealed that when the total solids content was adjusted to from 25 to 30 percent a stiff white foam of reasonable stability was produced. However, wide variations were encountered in the whipping properties of the different milks, overrun ranging from 150 to 450 percent and foam stability varying from 10 to 90 min. Heat treatment usually improved the whipping quality, but the drastic heat treatment used in atmospheric drum drying resulted in a product of relatively poor whipping quality and low foam stability. Commercial milk powders prepared for baking purposes generally possessed good whipping ability. The use of rennet or acid as stabilizing agents improved the set of the whip, but subsequent disturbance caused excessive wheying off. Fruit whips similar to an egg white product could be prepared by adding sugar to the skim milk foam and stabilizing the whip by stirring fruit pulp into it.

Flavor development in salted butter by pure culture of bacteria.—Preliminary results, W. H. HOECKER and B. W. HAMMER (*Iowa Sta. Res. Bul.* 290 (1941), pp. 317-345, figs. 2).—Six series of experimental churnings were made in which the diacetyl and acetylmethylcarbinol contents of the cream, butter-milk, and butter (fresh and after storage) and the flavor score of the butter from cream with no culture added were compared with those in which butter culture or pure cultures of *Streptococcus citrovorus*, *S. paracitrovorus*, *S. diacetylactis*, *S. citrophilus*, *S. aromaticus*, or an unidentified organism were added to the cream. Citric acid was added to all cultures, except *S. aromaticus*, before or during the incubation period.

All pure cultures in milk containing citric acid produced relatively large amounts of diacetyl and acetylmethylcarbinol, while *S. aromaticus* (which does not ferment citric acid) produced considerable diacetyl but only small amounts of the carbinol. The diacetyl contents of creams plus culture immediately after mixing were both higher and lower than the calculated theoretical amounts, while the carbinol contents were about the same as the theoretical values in most cases. Significant changes in these values occurred after hold-

ing the cream plus culture for 16 hr. at 40° F. Only small percentages of the diacetyl and acetylmethylcarbinol present in the cream plus culture were retained in the butter, the remainder occurring in the buttermilk. The percentage retention in butter was essentially the same in all cases. Butter made without the use of culture or with *S. aromaticus* contained only small amounts of diacetyl and acetylmethylcarbinol, whereas butter made with the other cultures usually contained appreciable amounts of these compounds. Both increases and decreases in diacetyl occurred during storage of butter either at 0° or 85°, larger changes usually occurring at the latter temperature. In some instances diacetyl content increased after 2 weeks' storage, followed by decreases after 4 weeks. The acetylmethylcarbinol content of the butter generally showed little change during storage. Butter made with citric acid-fermenting cultures usually contained relatively large amounts of diacetyl and acetylmethylcarbinol and such butters commonly placed high in a series of churnings, although butters containing exceptionally large amounts of these compounds sometimes placed low. Butter made without culture or with *S. aromaticus* usually placed low in the series.

The reliability of the room temperature holding test as an index to the keeping quality of butter, D. H. JACOBSEN, C. C. TOTMAN, and T. A. EVANS (S. Dak. State Col.). (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 883-890, fig. 1).—In further studies (E. S. R., 77, p. 844), 78 lots of butter representing 25 different South Dakota creameries were included. Duplicate 5-oz. samples of each were held at 70° F. for 7 days and at 40° for 28 days, respectively, after which all were subjected to scoring and microbiological analysis. When divided into groups showing loss in score of less than 1 point and 1 point or more on the basis of the 7-day holding test, there was a close agreement between the loss in score under the holding test and that at 40° for 1 mo., although the lower quality butters showed somewhat greater loss at the higher temperature. The room-temperature holding resulted in more bacterial deterioration than the low-temperature holding as reflected in the flavor produced and verified by the numbers of lipolytic and proteolytic bacteria present. It is concluded that the holding test is useful and fairly accurate as a means of detecting butter of unstable handling quality. The chief factor influencing the reliability of the test appears to be the difference in activity of certain types of bacteria at the incubation temperatures and at lower temperatures.

The bacteriological analysis of creamery waters, H. WOLOCHOW, H. R. THORNTON, and E. G. HOOD (*Canad. Dairy and Ice Cream Jour.*, 20 (1941), No. 2, pp. 23-25).—Eighty-five samples of water from 37 Alberta creamery water supplies were analyzed in this study. Data are presented on the total bacterial count and proteolytic counts obtained by plating on nutrient gelatin and on tryptone-glucose-beef extract-skim milk agar, each incubated at from 10° to 15° C. for 4 days. A large proportion of the waters examined were seriously contaminated with undesirable bacteria, capable of producing flavor defects in cream and butter. The practical aspects of these findings and also the shortcomings of methods commonly employed in water analysis are discussed.

Bacteriology of cheese.—VI, Relationship of fat hydrolysis to the ripening of Cheddar cheese, C. B. LANE and B. W. HAMMER (*Iowa Sta. Res. Bul.* 291 (1941), pp. 349-384).—Continuing this series of investigations (E. S. R., 84, p. 522), four types of milk were used in the various trials as follows: (1) Raw milk, (2) pasteurized milk, (3) skim milk (raw or pasteurized) plus homogenized cream (raw or pasteurized), and (4) pasteurized milk (or raw milk in a few trials) plus material containing lipolytic enzyme. The various sources of lipolytic enzyme included pancreatin; desiccated mammary tissues of cows,

ewes, and sows, and aqueous sodium chloride extracts of them; and desiccated liver and spleen tissues. A standardized manufacturing procedure was used throughout, and cheeses were scored for flavor, body, and texture at intervals during ripening.

Cheese made from raw homogenized cream mixed with skim milk (raw or pasteurized) commonly developed a rancid flavor early in ripening, but eventually the cheese was not rancid and was more satisfactory in flavor than cheese from pasteurized milk or from pasteurized homogenized cream mixed with pasteurized skim milk. In some cases it was even more satisfactory in flavor than cheese made from raw milk. Cheeses having relatively high fat acidities commonly ranked high in flavor. Cheese made from pasteurized milk had very low fat acidities and lacked flavor, while raw milk cheese had somewhat lower fat acidities than that made from raw homogenized cream plus skim milk but higher acidities than that made from pasteurized homogenized cream plus pasteurized skim milk. Cheese produced from pasteurized milk containing pancreatin developed a disagreeable rancid flavor immediately after manufacturing, and the condition did not disappear during ripening. The addition of desiccated mammary tissues or extracts of them to pasteurized milk induced rather marked lipolysis in the cheese and commonly had a desirable effect on the ripened cheese, although rancidity commonly occurred during the early stages of ripening. Such cheese generally contained slightly more soluble nitrogen than cheese made without such materials. Both desiccated liver and spleen tissues or extracts of them showed some lipolytic activity in cream-sugar mixtures. However, an extract of liver had little effect when added to pasteurized milk for cheese, while spleen tissue or extract sometimes showed a beneficial effect.

The control of acid development in Cheddar cheesemaking, R. M. DOLBY (*New Zeal. Jour. Sci. and Technol.*, 22 (1941), No. 5A, pp. 289A-302A, figs. 4).—Using pH of the curd as an index of acidity, the New Zealand Dairy Research Institute investigated the effects of certain modifications in the cheese-making process on the rate of acid production (E. S. R., 84, p. 811). Comparison of a number of starters differing considerably in activity, ability to withstand cooking temperatures, etc., indicated that when the percentage of starter and the acidity at running were adjusted to give the same rate of acid development in the later stages of the process, cheeses of the same pH were produced. Variations in the percentage of starter used markedly influenced the rate of acidity increase in the early stages but had a much less effect in the later stages. Acidity at the time of draining the whey definitely influenced the rate of acid production in the later stages and the acidity of the cheese, low acidity at the time of running tending to give a low acid cheese. The extent of stirring of the dry curd had no significant effect on the rate of acid development during drying and salting. Variations in the pH at the time of salting the curd had no appreciable effect on the acidity of the cheese. It did affect salt concentration, however, low acidity favoring a relatively high degree of salt retention. Cheese was found to be most highly buffered between pH 4 and pH 5. The use of pH measurements on the curd is recommended as a valuable step in controlling acid production during cheese making.

Observations on delayed salting of brick cheese, W. L. LANGHUS and W. V. PRICE. (Univ. Wis.). (*Jour. Dairy Sci.*, 24 (1941), No. 10, pp. 873-881).—Employing a standardized manufacturing process, experimental lots of brick cheese were made from both raw and pasteurized milks. Loaves of cheese from each lot were divided into groups before salting. Lots of the raw milk cheese were salted on the first or the fifth day after manufacture and the pasteurized cheeses on the first, fifth, or ninth day. All lots were salted by

holding in a 23-percent sodium chloride solution for 48 hr. When judged at 14 days of age, during which period the cheese was held in the factory, there was an apparent improvement in the body of the cheese as a result of delayed salting. After curing for 10 weeks, however, this benefit had disappeared, and the general quality of the cheese was not as good as that of cheese salted on the first day. It appeared that the addition of salt soon after making established a desirable trend in flavor production and body changes in brick cheese curd which did not occur when salting was delayed.

[Abstracts of papers on ice cream manufacturing] (*Internatl. Assoc. Ice Cream Mfrs. Ann. Conv., Atlantic City, Rpt. Proc., 40 (1940), vol. 2, pp. 7-49, 52-63, 74-85, 90-101, figs. 13*).—The following papers were presented before the Production and Laboratory Council: The Effect of Certain Factors on the Keeping Quality of Frozen Cream, by C. D. Dahle, R. K. Lawhorn, and J. L. Barnhart (pp. 7-23) (Pa. State Col.); Vacation of Ice Cream Mix, by N. E. Fabricius (pp. 23-31) (Iowa State Col.); Dextrose and Corn Syrup for Frozen Desserts, by A. C. Dahlberg and E. S. Penczek (pp. 31-40) (N. Y. State Expt. Sta.); The Use of Corn Syrup Solids in Ice Cream and Ices, by L. R. Glazier and M. J. Mack (pp. 40-47) (Mass. State Col.); Use of Enzyme Converted Corn Syrup in the Manufacture of Ice Cream, Sherbets, and Ices, by P. H. Tracy (pp. 47-49) (Univ. Ill.); Factors Affecting the Viscosity and Coverage Value of Chocolate Coating for Ice Cream, by J. H. Erb (pp. 52-63) (Ohio State Univ.); Increasing Production per Kilowatts Consumed, by R. E. Miller (pp. 74-85); The Injection of Fruit and Syrups in Frozen Ice Cream, by A. C. Routh (pp. 90-94); Fitting Ice Cream in the Food and Drug Act, by C. M. Fistere (pp. 94-100); and The Application of Motion Pictures as a Medium in Showing the Influence of Several Factors Upon the Stability and Melt-Down Properties of Several Different Kinds of Ice Cream, by W. H. E. Reid (p. 101) (Univ. Mo.).

VETERINARY MEDICINE

[Work in animal pathology by the New Hampshire Station] (*New Hampshire Sta. Bul. 330 (1941), pp. 27-28, 39-40, 40-41*).—The work of the year reported upon (E. S. R., 83, p. 823) includes studies of bovine mastitis, by L. W. Slanetz; incidence of gizzard erosion, by T. B. Charles, J. H. Gillespie, and C. L. Martin; poultry autopsies; ruptured egg yolk and its control by breeding, by R. C. Durgin, Charles, Martin, and C. A. Bortorff; and pullorum testing.

[Work in animal parasitology by the Puerto Rico University Station] (*Puerto Rico Univ. Sta. Bien. Rpt. 1939-40, Span. ed., pp. 128-136*).—A revision and extension by J. S. Andrews and J. F. Maldonado of data pertaining to the parasites of cattle, horses, and other animals as previously reported (E. S. R., 83, p. 677; 86, p. 87).

[Contributions on animal pathology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus., 15 (1940), No. 1-2, pp. 9-184, 261-277, 295-309, figs. 55*).—Among the contributions presented (E. S. R., 84, p. 814) are the following: The Study and Control of the Vectors of Rabies in South Africa, by P. S. Synman (pp. 9-140); Psittacosis in Domestic Pigeons, by J. D. W. A. Coles (pp. 141-148); The Susceptibility of Cattle to the Virus of Bluetongue (pp. 149-157) and Erosive Stomatitis of Cattle (pp. 159-173), both by J. H. Mason and W. O. Neitz; Rinderpest in Buffaloes—The Immunizing Value of Dried Goat Spleen Vaccine, by G. Pfaff (pp. 175-184); Recent Investigations Into the Toxicity of Known and Unknown Poisonous Plants in the Union of South Africa, X, by S. J. van der Walt and D. G. Steyn (pp. 261-277) (E. S. R., 84, p. 101); A Method for Preparing Sections of Bone Without Decalcification, by A. D. Thomas, R. Clark,

and K. Schultz (pp. 295-297); and Experimental Osteodystrophic Diseases in Goats, by J. W. Groenewald, A. D. Thomas, and B. A. du Toit (pp. 299-309).

Nutritional deficiency as a factor in the abnormal behavior of experimental animals, C. G. KING, H. W. KARN, and R. A. PATTON (*Science*, 94 (1941), No. 2434, p. 186).—A brief note.

The bracken problem, J. F. TOCHER (*Highland and Agr. Soc. Scot. Trans.*, 5. ser., 53 (1941), pp. 70-76).—A review of the progress of work with bracken poisoning, presented with a list of 41 references.

Diseases transmitted from animals to man, T. G. HULL (*Springfield, Ill.: Charles C. Thomas*, 1941, 2. ed., pp. XIII+403, figs. 45).—A revised edition of this work (E. S. R., 62, p. 668) in which the author has been assisted by 14 contributors. All chapters have been revised and brought up to date, and the chapters on animal parasites, fungus diseases, and psittacosis have been entirely rewritten. New chapters have been added on louping ill, sore mouth of sheep, equine encephalomyelitis, Rift Valley fever, typhus fever, and relapsing fever.

[Contributions on animal parasitology] (*Jour. Parasitol.*, 26 (1940), No. 6, Sup., pp. 14-45).—Among the contributions presented at the annual meeting of the American Society of Parasitologists held in Philadelphia, December 30 and 31, 1940, and January 1, 1941, abstracts of which are given, are: A Field Study of *Leucocytozoon bonasae* Clarke in Juvenile Ruffed Grouse (*Bonasa umbellus*), by E. C. O'Roke (p. 14); Duodenal Mucus of Fowls as a Nematode Growth Inhibitor, by J. E. Ackert and L. P. Frick (p. 14), and Intestinal Goblet Cells and Age Resistance to Parasitism, by J. E. Ackert and S. A. Edgar (pp. 14-15) (both Kans. State Col.); Studies of Phenothiazine and Related Substances as Anthelmintics, by P. D. Harwood, R. T. Haberman, and J. E. Guthrie (p. 15) (U. S. D. A.); The Influence of Biological Variation and Dosage-Time-Mortality Relationships on Anthelmintic Testing, by J. H. Whitlock (p. 15) (Kans. Expt. Sta.); Some Effects of Short Starvation Periods Upon the Fowl Cestode *Railletina cestitellus* (Molina), by W. M. Reid (p. 16) (Kans. State Col.); The Occurrence of *Diocetophyme renale* in Dogs of North Carolina, by H. W. Brown, A. J. Sheldon, and W. W. Taylor, Jr. (p. 16) (Univ. N. C.); *Cephenomyia* in Virginia Deer, by S. Hadwen (p. 16); In Vitro Conditions Favoring Ecdysis at the End of the First Parasitic Stage of *Haemonchus contortus*, by N. R. Stoll (pp. 16-17); Studies on Bovine Gastro-Intestinal Parasites—V, Immunity to the Stomachworm *Haemonchus contortus*, With a Note on the Prepatent Period, by R. L. Mayhew, and VI, The Blood Picture in Stomachworm (*Haemonchus contortus*) Infections, by E. T. Delaune and R. L. Mayhew (p. 17) (both La. State Univ.) (see page 388); The Internal Parasites of Puerto Rican Cattle, With Special Reference to the Species Found in Calves Suffering from "Tropical Diarrhea," by J. S. Andrews (p. 18) (P. R. Sta.); Host-Parasite Relations of *Moniliformis dubius* (Acanthocephala) in White Rats and the Environmental Nature of Resistance to Single and Superimposed Infections With This Parasite, by P. L. Burlingame and A. C. Chandler (p. 18); Survival of Eggs of the Swine Ascarid in Cultivated Soil, by L. A. Spindler (p. 19), and Survival on Soil of Eggs of the Swine Thorn-Headed Worm *Macracanthorhynchus hirudinaceus*, by L. A. Spindler and K. C. Kates (p. 19) (both U. S. D. A.); Treatment of Canine Heartworm *Dirofilaria immitis* With Fuadin and Sulfanilamide, by H. W. Brown and A. J. Sheldon (pp. 19-20) (Univ. N. C. et al.); *Crenosoma mephitis* in Dogs, by M. Hobmaier (p. 20) (Univ. Calif.); Permanent Stained Preparations of Thick Blood Films, by W. D. Gingrich (p. 20); A Preliminary Report of Human and Equine Encephalitis in Weld County, Colorado, in the Late Summer and Fall of 1940, by C. B. Philip, H. R. Cox, and J. H. Fountain (p. 24); The Relation of Vitamins B₁ and B₆ to *Eimeria*

nieschulzi Infection of the Rat, by E. R. Becker (p. 26) (Iowa State Col.); Studies on the Types of Cells Infected by *Leucocytozoon*, by C. G. Huff (p. 27); Virulence and Exoerythrocytic Schizogony in Four Species of *Plasmodium* in Domestic Ducks, by F. Wolfson (p. 28); Modifications of *Plasmodium cathemerium* in Canaries, Ducks, and Fowls, by R. Hegner (p. 28); The Effect of Intraperitoneal Injections of Carbon Ink on the Course of *Plasmodium lophurae* Infections in Chickens, by W. Trager (p. 28); Culturing *Trichinella spiralis* in Vitro—I, Preliminary Experiments—A Basic Medium to Sustain Larvae Unchanged for Long Periods in Vitro, by A. J. Levin (p. 31); Effect of Roentgen Radiation on Embryonic Development of *Trichinella spiralis*, by A. J. Levin and T. C. Evans (p. 31); A Revision of the Subfamily Dicrocoelinae Looss, 1899, With New Species From North American Birds, by J. F. Denton (p. 34); Beetle Supply in Experimental Fowl Taeniasis, by J. E. Ackert and A. A. Case (pp. 43-44) (Kans. State Col.); A Further Note on the Cultivation of *Taenia taeniaeformis* Larvae in Vitro, With a Preliminary Report on the Respiration of These Parasites, by J. H. Wilmoth (p. 44); The Effect of Host Vitamin E Deficiency on *Trichinella spiralis* Infections, by H. Zaiman (p. 44); and The Infection of *Anopheles quadrimaculatus* With a Monkey Malaria Parasite, *Plasmodium cynomolgi*, and With an Avian Parasite, *Plasmodium lophurae*, by L. T. Coggeshall (pp. 44-45).

Examination of grass and soil to determine the population of infective larval nematodes on pastures, G. P. KAUFAL (*Austral. Vet. Jour.*, 17 (1941), No. 5, pp. 181-184, figs. 3).—It was found in an experimental study of grass plats contaminated with infective larvae of *Haemonchus contortus* that the examination of grass alone for the purpose of estimating the extent to which an area is infested is not sufficient. A maximum of only 16 percent was recovered from the grass, whereas the maximum from the soil was 75 percent. Considerable fluctuations in the number of larvae present in the soil and on the grass were observed and could be correlated with the existing weather conditions. The results also show that successful recovery of larvae from grass pasture is dependent on the presence of an optimal number of grass blades on which migration may take place, on favorable weather conditions, and on the vitality of the larvae.

Observations on the infection of chick embryos with *Bacterium tularense*, *Brucella*, and *Pasteurella pestis*, G. J. BUNDINGH and F. C. WOMACK, JR. (*Jour. Bact. Med.*, 74 (1941), No. 3, pp. 213-222, pls. 3).—Experimental infection of chick embryos by the chorioallantoic route have shown *Bacterium tularense* and *Brucella suis*, *B. abortus*, and *B. melitensis* to exhibit varying degrees of facultative intracellular parasitism. *P. pestis* is adapted to rapid proliferation and spread in the intercellular fluids. In the early stages of infection *Bacterium tularense* has a marked affinity for growth within ectodermal epithelial cells. *Brucella suis* and *B. abortus* differ in their selectivity for cells of mesodermal derivation and especially in their effect on vascular endothelium. The strain of *B. melitensis* studied is limited in its intracellular growth to ectodermal epithelium. Many of the features characteristic of these infections in the natural hosts are reproduced in the chick embryo and its membranes. The possible implications regarding the differences in behavior of these micro-organisms in relation to the problem of infection and pathogenesis of the diseases are discussed.

Electrophoresis studies on *Brucella*, T. W. STEARNS and M. H. ROEPKE (Minn. Expt. Sta.). (*Jour. Bact.*, 42 (1941), No. 3, pp. 411-430, figs. 3).—It has been found that different strains of *Brucella* may show different variations of electrophoretic mobility with age of culture. Smooth strains of the bovine,

porcine, and caprine types have the same electrophoretic mobility value regardless of the animal species from which isolations were made. Recently isolated strains and laboratory strains recently passed through guinea pigs have slightly lower mobilities than those cultivated on media for a few transfers. A criticism of the literature on electrophoresis of bacteria is included. A review of the literature includes a list of 23 references.

Encephalitis in the Yakima Valley: Mixed St. Louis and western equine types. W. M. HAMMON (*Jour. Amer. Med. Assoc.*, 117 (1941), No. 3, pp. 161-167, fig. 1).—Report is made of a survey conducted during the late summer of 1940 in the Yakima Valley, Washington, where in 1939 more than 600 cases of encephalomyelitis in horses and 31 cases of encephalitis in man were reported and encephalitis had again appeared in epidemic proportion. A diagnosis of encephalitis type B (St. Louis or equine or both) was definitely established in 58 of 86 reported cases. Clinical, epidemiological, and laboratory evidence all indicated the presence of both viruses, and it is thought probable that some patients had mixed infections. The blood serum of certain mammals and birds from the region showed neutralizing antibodies to one or both of these viruses.

Western equine and St. Louis encephalitis antibodies in the sera of mammals and birds from an endemic area. W. M. HAMMON, J. A. GRAY, JR., F. C. EVANS, E. M. IZUMI, and H. W. LUNDY. (*Univ. Calif. and Wash. State Col.*). (*Science*, 94 (1941), No. 2439, pp. 305-307).—Evidence obtained by Hammon as noted above led to the extensive survey in the same area in 1941 here reported upon. Commenced in May, the work was continued during the epidemic of that year. The serums from mammals and birds, both domestic and wild, were tested for the presence of neutralizing antibodies to both of these viruses and to certain others. It was decided that as a preliminary survey, approach through the neutralization test would yield more information regarding the extent of infection and possible reservoirs than a search for the actual viruses, since infection had never been manifested by any observed epizootic except in horses, thus differing from the eastern equine virus. Thus far, the serums of 162 birds and 153 mammals have been tested against the St. Louis virus and of 172 birds and 161 mammals against the equine virus. The results are tabulated for (1) domestic or captive and (2) wild birds and mammals.

It is considered probable that the antibodies found in many of the species recorded are the result of specific infection, probably of a mild or inapparent nature. For the St. Louis virus, 50 percent of 70 domestic birds showed protection as against 15 percent of 87 wild birds, and for the equine virus the respective percentages are 48.7 of 74 and 20 of 80. Of 77 domestic mammals tested, 37.7 percent protected against the St. Louis virus in contrast to 9.2 percent of 65 wild, and for the equine virus 32.4 percent of 71 domestic as against 5.1 percent of 78 wild. Caution is suggested in interpretation of these differences between the domestic and wild animal groups until both the areas of sampling and the species sampling can be more carefully analyzed. However, both the domestic and wild species were collected principally in areas where cases of encephalitis had occurred in 1939, 1940, or 1941. If the apparent significance of these findings is confirmed, it will indicate a much more widespread potential reservoir for both viruses than has generally been suspected, especially for the St. Louis virus. It would appear that barnyards and fowl runs, found in large numbers in small towns and rural and suburban areas, are the principal foci of infection for encephalitis of either the western equine or the St. Louis type. The distribution of human and obviously of horse cases has conformed with this pattern.

Isolation of the viruses of western equine and St. Louis encephalitis from *Culex tarsalis* mosquitoes, W. M. HAMMON, W. C. REEVES, B. BROOKMAN, E. M. IZUMI, and C. M. GJULLIN. (Univ. Calif., U. S. D. A., et al.). (*Science*, 94 (1941), No. 2440, pp. 328-330).—A preliminary report is made of the isolation of the St. Louis and western equine viruses of encephalitis from *C. tarsalis* taken in routine entomological collections in the Yakima Valley, Washington, where human encephalitis cases had occurred during the current or preceding year.

A note on variations in the efficiency of the copper sulphate and nicotine sulphate drench against *Haemonchus contortus*, H. M. GORDON and L. K. WHITTEN (*Austral. Vet. Jour.*, 17 (1941), No. 5, pp. 172-176).—The repeated failure of individual sheep to respond to treatment with copper sulfate-nicotine sulfate mixture administered against *H. contortus* explains those instances in which outbreaks of haemonchosis are not satisfactorily controlled by repeated drenching with this mixture. This is thought to be due to the failure of the oesophageal groove to close in certain individuals. Such cases can be successfully treated with carbon tetrachloride.

The use of thallium acetate glucose broth in the diagnosis of streptococcal mastitis, D. A. MCKENZIE (*Vet. Rec.*, 53 (1941), No. 33, pp. 473-480, figs. 3).—The selective action of thallium acetate on pure cultures of various organisms is described and a comparison made with sodium azide, potassium tellurite, telluric acid, and thallium nitrate. Its action in the diagnosis of streptococcal mastitis in quarter and individual milk samples is reported upon. A medium containing thallium acetate, glucose, and crystal violet is recommended for such work, and a simple and rapid technic is described.

The transmission of Q fever by the tick *Rhipicephalus sanguineus*, D. J. W. SMITH (*Austral. Jour. Expt. Biol. and Med. Sci.*, 19 (1941), No. 2, pp. 133-136).—It is concluded that the brown dog tick, which occurs in northern Australia on domestic animals, known or potential reservoirs of infection, may be a potential vector of so-called Q fever. "Larval, nymphal, and adult ticks were infected with Q fever by feeding them upon infected guinea pigs during the febrile period. The virus was passed from larvae to nymphs and from nymphs to adults, but not from the latter to their progeny. Infected nymphs and adults infected their host guinea pigs in 63 percent and 92 percent of cases, respectively. In infected ticks rickettsiae were seen only in the lumen and lining epithelium of the midgut. Invasion of the nuclei of infected cells was not observed. One-hundred-millionth of a gram of feces from infected ticks was found, 65 days after collection, to infect guinea pigs. Suspensions of rickettsiae suitable for agglutination tests were readily prepared from infected ticks."

The demonstration of non-specific components in *Salmonella paratyphi* A by induced variation, D. W. BRUNER and P. R. EDWARDS. (Ky. Expt. Sta.). (*Jour. Bact.*, 42 (1941), No. 4, pp. 461-478, figs. 2).

Selective action of sulfanilyl-guanidine on different *Salmonella* types and its practical importance, S. BORNSTEIN and L. STRAUSS (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 1, pp. 112-115).—In a study of the action of sulfanilyl guanidine, 74 types of organisms of the *Salmonella* group, 15 strains of *Escherichia coli*, 4 strains of *Shigella*, and a strain of *Aerobacter* were tested. "Of all the *Salmonella* organisms tested, only the typhoid bacillus (*S. typhi*), *S. paratyphi* A, and *S. choleraesuis* showed any marked degree of inhibition. Very slight inhibitory action was noted on *S. paratyphi* C, *S. abortus equi*, *S. sendai*, *S. gallinarum*, *S. muenster*, and *S. newington*. While *Aerobacter* was resistant and all 4 dysentery strains were strongly inhibited, the 15 strains of *E. coli* showed individual differences. In *Salmonella* organisms, however, no marked

differences between strains of the same type were noticed when 2 strains of *S. paratyphi* A, 7 strains of *S. choleraesuis*, 6 strains of *S. typhi*, and 10 strains each of *S. paratyphi* B and *S. typhimurium* were tested." The findings seem to indicate that sulfanilyl guanidine treatment of infections with *Salmonellas* other than the susceptible types may even be harmful.

Experiment in *Trypanosoma evansi*, A. R. KUPPUSWAMY (*Indian Vet. Jour.*, 18 (1941), No. 2, pp. 59-74, pls. 6, figs. 5).—Experimental work with *T. evansi* indicates that passage through the goat does not attenuate its virulence. The goat used in the experiment remained infective for a year, 8 mo., and 20 days. The mercuric chloride and Formal-Gul tests are considered of doubtful value when applied to the goat and calf.

Retained placenta, M. G. FINCHER (Cornell Univ.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 395-404, figs. 5).—Following a review of the theories regarding its etiology, the results of the treatment of 3,500 cases of retained placenta in cattle are discussed.

An extended study of female offspring of positive Bang's diseased cattle, C. P. FITCH, W. L. BOYD, M. D. KELLY, and L. M. BISHOP (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 413-414).—Report is made of a 7-yr. study conducted in a herd of 56 females which was built up from dams that had positive reactions to the agglutination test for Bang's disease. Each calf was separated from the infected dam immediately and, except for nursing periods for 1 week, was put with the clean herd as soon as it showed a negative titer. It was then carefully observed through every lactation. In examinations of this herd *Brucella abortus* was not isolated from any of the milk, colostrum, placental membranes, vaginal discharges, fetuses, or calves that were examined shortly after birth. It is pointed out that this work confirms findings reported from the Oregon Experiment Station (*E. S. R.*, 59, p. 778).

Preliminary trials on the administration of sulphonamide E. O. S. and of 4:4'-diaminodiphenylsulphone to normal cattle and to cattle affected with streptococcal mastitis, A. D. McEWEN, N. H. PRIZER, and J. D. PATERSON (*Vet. Rec.*, 53 (1941), No. 30, pp. 429-436).—While 4:4'-diaminodiphenylsulfone was found to improve the clinical condition of the infected udder without producing any toxic symptoms, the experiments reported are considered insufficient to warrant definite conclusions regarding its value in the treatment of mastitis other than that for this purpose it is equal in value to and free from some of the objectionable properties of sulfanilamide.

A further note on diagnosis and treatment of bovine *Trichomonas* infection, W. M. SWANGARD (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 404-406, fig. 1).—A description is given of an instrument the use of which with a microscope of moderate efficiency makes possible the diagnosis of *T. bovis* (foetus) infection in the field.

Bovine trypanosomiasis in Panama, C. M. JOHNSON (*Amer. Jour. Trop. Med.*, 21 (1941), No. 2, pp. 289-297, fig. 1).—*Trypanosoma vivax* (*T. guyanense*, Leger and Vienne 1919), known for many years to exist in the countries south of Panama, was found by the author during the preceding 6 mo. to infect cattle in the central portion of Panama. It is concluded that the parasite had been introduced into Panama during the past 5 yr. through the importation of cattle from the countries to the south. A series of animals was inoculated with the parasite, but infections were successfully established only in calves, goats, and horses. The ordinary small laboratory animal was not susceptible. The trypanosome is well established in the local animals, as surveys of a number of herds revealed that from 5 to over 50 percent of their members were infected. The symptoms exhibited by the infected animals are not charac-

teristic. Fever, anemia, and emaciation are the most common manifestations, while, in some, weakness of the posterior extremities, edema, and loss of appetite are sometimes present. Diagnosis is best accomplished by thick blood smear methods and by gland puncture.

Studies on bovine gastro-intestinal parasites.—III, The blood picture in hookworm and nodular worm infection, with some observations on the normal, E. T. DELAUNE and R. L. MAYHEW. (La. State Univ.). (*Amer. Micros. Soc. Trans.*, 60 (1941), No. 3, pp. 293-308, figs. 3).—In continuation of this work (E. S. R., 84, p. 394), report is made of a study of the erythrocyte, leucocyte, and differential cell values as found in two calves infected with nodular worms (*Oesophagostomum radiatum*) and three infected with *O. radiatum* and hookworms (*Bunostomum phlebotomum*). Data are given on the complete blood picture of normal healthy castrated males on pasture and healthy cows in a dairy herd at Baton Rouge, La., for comparison with the experimental animals. A bibliography of 36 titles is included.

Studies on bovine gastro-intestinal parasites.—IV, Influence of hay consumption on egg counts, R. L. MAYHEW. (La. State Univ.). (*Cornell Vet.*, 30 (1940), No. 4, pp. 495-498, figs. 5).—In continuation of the above, data are presented which indicate that the amount of hay consumed influences inversely the number of nematode eggs counted per gram of sediment. Eight instances in five calves of increased egg count due to reduction of the amount of hay consumed are reported. The time required to affect the change in count after the change in amount of hay consumed is usually 1 to 3 days according to the data obtained.

The value and relative effectiveness of preparations of rotenone, derris powder, and cube powder as larvicides for cattle grubs, C. E. SMITH, E. LIVENGOD, and I. H. ROBERTS. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 391-394).—Experiments conducted in the vicinity of Colorado Springs, Colo., during the grub seasons of 1938 and 1939 and in north-central Missouri in 1940 are reported. Chemically pure rotenone and a preparation containing 90 percent of rotenone used in the form of washes and applied to infested cattle once during the grub season were not as effective in killing cattle grubs in situ as derris or cube washes. Standardized commercial derris powder and cube powder used in the form of washes were equally effective in killing cattle grubs in situ, and derris powder and cube powder classed by the manufacturer as containing 4 percent of rotenone were as effective in killing cattle grubs as like powders said to contain 5 percent of rotenone. Washes made in the proportion of 12 oz. of derris or cube powder to 1 gal. of water were as effective as those made in the proportion of 16 oz. to 1 gal. Washes containing 8 oz. of derris or cube powder to 1 gal. of water were not fully effective, but washes made in the proportion of 4 oz. of soap dissolved in 1 gal. of warm water and 12 oz. of either derris or cube powder proved to be safe and effective. Single treatments of infested cattle with derris or cube washes containing 12 oz. or more of powder to 1 gal. of water and applied about 30 days after the first grub openings killed from 90 to 100 percent of the grubs appearing in the treated cattle during the grub season. One treatment a season with derris or cube washes can not be depended upon to eradicate grubs of *Hypoderma lineatum*, but it can be depended upon to effect a fair measure of control. Cattle were not visibly injured in any way by washes applied during cold weather.

Cattle spray testing, F. C. NELSON (*Soap and Sanit. Chem.*, 17 (1941), No. 8, pp. 92-97, 119, 121, fig. 1).—This contribution is presented with a bibliography of 76 titles.

Studies on deglutition in sheep (*Austral. Vet. Jour.*, 17 (1941), Nos. 2, pp. 52-58; 4, pp. 137-142).—The first of these papers is A Résumé of Observations on the Course Taken by Liquids Through the Stomach of Sheep at Various Ages From Birth to Four Years, by R. H. Watson; the second is A Résumé of Observations on the Influence of Copper Salts on the Course Taken by Liquids Into the Stomach of the Sheep, by R. H. Watson and I. G. Jarrett.

A filterable virus demonstrated to be the infective agent in ovine balanoposthitis, E. A. TUNNICLIFF and P. H. MATISHECK. (Mont. Expt. Sta.). (*Science*, 94 (1941), No. 2438, pp. 283-284).—In their studies of this disease of sheep the authors succeeded in the preparation of infective, bacteria-free filtrates. A description is given of the technic by which such filtrates were obtained. Typical lesions were produced on the prepuces of experimentally inoculated rams with each of four filtrates prepared. The disease was again transmitted to healthy experimental rams by prepuce inoculations with virus suspensions from two of the filtrate-produced cases.

A study of the blood picture of lambs suffering from parasitic gastritis, H. H. HOLMAN and I. H. PATTISON (*Vet. Rec.*, 53 (1941), No. 34, pp. 491-498, figs. 3).

The use of phenothiazine for the control of oesophagostomiasis (nodule worm disease) of sheep, H. M. GORDON (*Austral. Vet. Jour.*, 17 (1941), No. 5, pp. 166-172, figs. 2).—A discussion of the use of phenothiazine in the control of *Oesophagostomum columbianum*, one of the most important parasites of sheep in eastern Australia.

Fining in sheep: Its control by administration of cobalt and by use of cobalt-rich fertilizers, J. STEWART, R. L. MITCHELL, and A. B. STEWART (*Empire Jour. Expt. Agr.*, 9 (1941), No. 34, pp. 145-152).

Cultivation of the hog cholera virus, C. TENBROECK (*Jour. Expt. Med.*, 74 (1941), No. 5, pp. 427-432).—The author has readily confirmed the work of F. Hecke¹ on the cultivation of hog cholera virus. It was grown in the presence of fresh minced swine testicle in flasks containing Tyrode solution, on the chorioallantoic membrane of embryonated eggs, and on the surface of swine serum agar. "In flasks it was grown for 14 transfers, while on eggs it was grown for 13 transfers, followed by an equal number of transfers on agar, making 26 transfers in all. Only one strain of virus was used, and we do not know whether all strains can be cultivated so readily or whether we were particularly fortunate in the selection of the strain used. Neither do we know whether swine testicle is better than other tissues for growth.

"The cultured virus produces characteristic hog cholera when injected into swine, and its effect can be neutralized with commercial anti-hog-cholera serum. No evidence of attenuation of the virus was obtained, the last culture being highly virulent when small amounts were injected. No evidence for the adaptation to the egg could be secured, since passages without swine testicle on the membrane or intravenously for 2 transfers resulted in a loss of the virus. No contaminating virus that might favor the cultivation could be detected by animal or egg inoculation.

"Not only has the virus been cultivated, but it has been demonstrated in large amounts in the culture. Four suspensions containing slightly over 0.5 mg. of protein nitrogen produced typical hog cholera when 1×10^{-8} cc. was injected, and one suspension made in the same way was active in one-tenth this amount. Few titrations on what is commonly known as hog cholera virus, i. e., the serum from acutely ill pigs, are available. We made one such titration and produced a delayed disease with 1×10^{-8} cc. of infectious serum. It seems probable that

¹ Zentbl. Bakt. [etc.], 1. Abt., Orig., 126 (1932), No. 7-8, pp. 517-526, figs. 3.

the culture virus is more active than the commonly used virus, and that its practical use in hog cholera vaccination and hyperimmunization would result in a considerable saving. All of the methods used yielded active cultures, but the serum agar method is the one of choice since larger amounts of suspension can be obtained with less labor."

Diseases of swine due to nutritive deficiencies, H. C. H. KERNKAMP. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 373-381).

Sulphanilamide in the treatment of equine diseases, S. L. HIGNETT (*Jour. Roy. Army Vet. Corps*, 12 (1940), No. 1, pp. 3-16).—This discussion is presented with a list of 35 references to the literature.

Treatment of Percheron horses for gastrointestinal parasites with a phenothiazine-carbon disulfide mixture, L. E. BOLEY, N. D. LEVINE, W. L. WRIGHT, and R. GRAHAM. (Univ. Ill.). (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 408-411).—In the treatment of 24 Percheron horses for gastrointestinal parasites, a mixture of phenothiazine (40 gm.) and carbon disulfide (24 cc.) was administered in capsules following a 36-hr. fast without clinical evidence of illness. Pre- and post-treatment fecal egg counts indicated that ascarid and strongyle eggs were eliminated or greatly reduced, and these two parasites as well as bots were observed in the feces of the horses following treatment. Pre- and post-treatment examination of blood and urine of the treated horses revealed no significant evidence of anemia or kidney damage.

Experiments with phenothiazine in the treatment of horses for strongyles, V. B. ROBINSON and J. M. KAYS. (Univ. Mo.). (*Vet. Med.*, 36 (1941), No. 11, pp. 557-559).—The treatment of horses with phenothiazine in January 1941 for removal of strongyles was followed by egg counts which indicate that this anthelmintic is fairly effective in doses as small as 25 gm.

The susceptibility of dogs to virus of equine encephalomyelitis (western), C. F. SCHLOTTHAUER (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 388-390, figs. 2).—In transmission work it has been demonstrated that some dogs are susceptible to the western type of the virus of equine encephalomyelitis. In two of three young dogs inoculated intracerebrally with 0.5 cc. of a dense suspension of infected guinea pig brain, and in one of six young dogs inoculated in the pad of the right hind foot with 1 cc. of a similar suspension of brain, disseminated encephalitis developed and the dogs succumbed. The lesions noted microscopically in the brain were characteristic of those caused by neurotropic viruses.

A report on the failure of phenothiazine as an anthelmintic against the common nematodes of dogs in Australia, G. P. KAUFAL and L. K. WHITTEN (*Austral. Vet. Jour.*, 17 (1941), No. 5, pp. 185-187).—In tests conducted, phenothiazine in single doses of from 1 to 10 gm. or repeated doses of from 1 to 3 gm. was found to be erratic and generally unsatisfactory against the ascarids of dogs. It was usually ineffective against *Ancylostoma* and was almost completely so against *Trichuris*.

Changes occurring in the blood and tissue of chickens during coccidiosis and artificial hemorrhage, S. H. WAXLER. (Wis. Expt. Sta.). (*Amer. Jour. Physiol.*, 134 (1941), No. 1, pp. 19-26, fig. 1).—Studies of the blood of chickens affected with cecal coccidiosis indicated: "(1) There is an increase of the blood chloride on the sixth and seventh day of an infection of cecal coccidiosis in chickens. (2) The rise in the blood sugar, due to coccidiosis, is apparent on the fifth day, a day prior to the rise of the chlorides. (3) Artificial hemorrhage produces an increase in the blood chloride and sugar approximate to that brought about by bleeding from coccidiosis. (4) The chloride content of the blood is maintained at the normal level after severe artificial hemorrhage

by the injection of 6 percent sodium chloride-free gum acacia solution. (5) The chloride content of the muscle shows a downward trend during coccidiosis and may account in part for the rise in the blood chloride."

Gizzard erosion as a disease problem in the field, H. R. BAKER and L. M. GREENE (*Poultry Sci.*, 20 (1941), No. 5, p. 455).—Erosion of the gizzard lining of nutritional origin was diagnosed in Delaware in August, September, and November, 1939, as present in over 50 percent of the flocks serviced. Growth was affected, heavy mortality resulted, and many of the recovered birds that had been severely affected were permanently stunted. Over 500 chicks succumbed in a flock of 6,000 during a 24-hr. period. Although not supported by laboratory results, field experiences are considered to justify the conclusion that gizzard erosion in day-old chicks and sexually mature fowl does occur alone, stunts birds, and at times causes heavy mortality. In uncomplicated cases recovery is evident soon after treatment is started.

The fowl leukosis battle, C. D. LEE and A. J. G. MAW. (Iowa State Col.). (*U. S. Egg and Poultry Mag.*, 47 (1941), No. 10, pp. 588-591, 629, figs. 2).—It is concluded that a thorough culling and breeding program will control this major disease of poultry.

Twenty-first annual report on eradication of pullorum disease in Massachusetts, H. VAN ROEKEL ET AL. (*Massachusetts Sta. Control Ser. Bul.* 108 (1941), pp. 11).—Report (E. S. R., 84, p. 107) is made of the results of eradication work conducted during the 1940-41 season. A total of 538,589 blood samples from 527,328 birds in 309 flocks in 11 counties were tested, with 0.09 percent reacting positively, the lowest in the testing history. In 6 counties all the tested flocks were classified as nonreacting. No reactors were detected among flocks tested in Worcester County, which led in the number of tested birds (89,041). Fewer "breaks" were encountered than during the preceding season. The details are given in accompanying tables.

Post-mortem changes in New York dressed poultry at 35° F., G. F. STEWART, B. LOWE, and M. MORR. (Iowa Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 47 (1941), No. 9, pp. 542-544, 571-572, figs. 4).—A study.

Studies on the gapeworm *Syngamus trachea* (Montagu, 1811) in robins and chickens, R. C. RIPLEY. (Univ. Nebr.). (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 369-374).—About 33 percent of 76 robins collected at Lincoln, Nebr., were found infected with gapeworms which morphologically could not be distinguished from *S. trachea* of domestic poultry. Several attempts to infect chickens with recently incubated eggs from the robin gapeworm were unsuccessful, but earthworms of the species *Eisenia foetida* that were fed incubated eggs of the robin gapeworm produced an infection in one of six chickens. Eggs of the robin gapeworm kept in cold storage for 6 mo., then incubated and fed in large numbers, resulted in infections in two of six chickens. The author emphasizes the fact that, while cross-infection experiments confirm the identity of the robin and chicken gapeworms, because of the difficulty of cross-infection it is by no means certain that such transfers occur in nature.

Observations on intestinal worms in a young robin (*Turdus migratorius migratorius*), C. B. WORTH (*Bird-Banding*, 12 (1941), No. 4, pp. 175-176).—The infestation of a young robin by spirurid and ascaroid nematodes, tape-worms, and Acanthocephala is reported.

Blood parasites of birds of the District of Columbia and Patuxent Research Refuge vicinity, P. W. WETMORE (*Jour. Parasitol.*, 27 (1941), No. 5, pp. 379-393).—In the course of work commenced in the summer of 1938, blood parasites were found in 30 percent of the 618 birds collected in the District of Columbia and examined. Six genera of parasites found in a total of 268 infections are reported upon.

3,000 wild bird autopsies on western lake areas, E. R. QUORTRUP and J. E. SHEILLINGER (*Jour. Amer. Vet. Med. Assoc.*, 99 (1941), No. 776, pp. 382-387, figs. 4).—The results of 3,000 post-mortem examinations made at the Bear River Wildlife Disease Research Station in Utah during 4 yr. of research that dealt primarily with botulism of waterfowl are reported. Botulism was the cause of 47.9 percent of the deaths, mechanical injury, including gunshot, 18.5 percent, and lead poisoning 8.6 percent, with the remainder due to at least 20 different causes. It is pointed out that wild species are probably subject to as great a variety of disease conditions as are domestic poultry, and that they are less tolerant of autopolution and unhealthful environments than are farm flocks.

AGRICULTURAL ENGINEERING

[**Agricultural engineering investigations by the New Hampshire Station**] (*New Hampshire Sta. Bul.* 330 (1941), pp. 20-21).—This report notes work by W. T. Ackerman on the design of small potato storages for farm use, and on dehydration and processing of medicinal herbs, a drier capable of dehydrating 200 lb. of green material to U. S. P. specifications in from 30 to 60 hr. having been constructed.

Runoff from small agricultural watersheds, D. W. CARDWELL (U. S. D. A.). (*Agr. Engin.*, 21 (1940), No. 12, pp. 479-481, 482, fig. 1).—This paper, pointing out the now recognized inadequacy of the coefficient C in the run-off equation $Q=CIA$ and the lack of coefficients for various soil, slope, and cover conditions, presents analyses of the available results (those of the period from August 1, 1938, to September 30, 1939) of work on three watersheds at Danville, Va., and on four watersheds at Americus, Ga., with a tabular summary of the characteristics of the watersheds concerned. It is shown that one of the difficulties standing in the way of obtaining accurate figures by means of the CIA formula lies in the fact that the so-called time of concentration—the time required, under fairly constant rainfall, for all parts of the watershed to contribute to the flow—can be determined only in very few rains, most storms failing to meet the conditions required for such a determination. It is considered that definite recommendations for practical applications cannot be made without further study of the results thus far secured and yet to be obtained. The preliminary results as discussed, however, serve to indicate the wide differences which may be expected between the run-off capabilities of various problem areas and to emphasize the need for additional investigation.

Terrace dimension changes and the movement of terrace ridges, L. H. SCHOENLEBER (U. S. D. A.). (*Agr. Engin.*, 21 (1940), No. 12, pp. 477-478, fig. 1).—Results of 8 years' study of terrace stability at the Soil Conservation Service experiment station near Clarinda, Iowa, are discussed. The slope ranged from 6 to 11 percent. Effects of various crops and tillage practices were considered. Terrace cross sections were made on nearly 10 miles of terrace at each 100 ft. and elevations taken at low point in channel and high point of ridge at stations 50 ft. apart, and nearly 4,000 ft. of soil-movement lines were established at right angles to terrace ridges from the top to the bottom of the slope.

Terrace dimension changes when various crops are grown are due primarily to the methods and type of tillage operations performed. Average terrace cross section will probably increase when all tillage operations are performed parallel to the terrace ridge and when plowing is performed by backfurfrowing to ridge, leaving dead furrow in the channel and throwing all furrows uphill. The two different surveys employed to determine terrace dimension changes proved

satisfactory. However, only two dimensions, terrace cross section and terrace ridge height, could be determined from the terrace-section survey. Terrace ridges do not creep down the hill slope and do not change their relative locations with respect to other terraces under farming practices similar to those used. With proper farming practices, adequate terrace cross sections can be maintained which will avoid the necessity of separate operations to maintain or rebuild terraces.

Maintenance of open drainage ditches, E. A. KREKOW. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 1, pp. 7-8, figs. 2).—This brief discussion is concerned mainly with ditches primarily intended as tile-drainage outlets and as auxiliary surface drainage. It is based principally upon study of drainage problems and conditions in Kossuth and adjoining counties in Iowa. A revision of drainage laws, including a consolidation of districts or a larger taxing base, with perhaps even the entire county as a unit, is considered needful. A small annual levy in lieu of the special assessments as now spread is desirable, together with interchange of equipment between drainage districts and county road maintenance departments on a rental basis, permanently appointed drainage maintenance engineer whose duties would be similar to those of the present county engineer with relation to roads, and good land use practices, best accomplished by cooperation between the drainage engineer and the county agent, as well as cooperation with State and Federal agencies.

Hydraulic tests of kudzu as a conservation channel lining, W. O. REE. (U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 1, pp. 27-29, figs. 4).—Kudzu, or *Pueraria thunbergiana*, is a prolific perennial of dense foliage, rooting under favorable conditions wherever a node touches the ground and suitable for planting in the southeastern United States. Data concerning the hydraulic and protective characteristics of kudzu as a drainage channel lining were obtained in tests made at various times in one experimental channel, 50 ft. long, bottom slope 3 percent, bottom width 4 ft., and side slopes of 1 vertical to 1.5 horizontal. The channel was made in Cecil subsoil and lined with Cecil sandy loam topsoil, treated with 700 lb. complete fertilizer per acre and planted to kudzu crowns on rectangles 1.5 by 1 ft. about 2 weeks later. The first tests were run 8 mo. after the planting. In the second year of growth tests were run in August, the vines being green, and in the following February when the plants were dormant. Probable safe design velocities for channels protected by live second-year growth and by dead second-year growth were determined at 4 and 2.5 ft. per second, respectively. A tabular summary of hydraulic data includes the retardance coefficient, n , as used in the formulas both of Kutter and Manning. These data cover five runs in each of the three tests noted above.

The sanitary evaluation of private water supplies, R. L. FRANCE (*Massachusetts Sta. Bul.* 383 (1941), pp. 11).—This is a popular outline of the subject of the pollution and contamination of spring and well waters, their protection from the entrance of substances rendering them unfit for human consumption, and their bacteriological examination for the detection of pollution and contamination. It is noted that but two diseases (typhoid fever and dysentery) are known to have been spread by water-supply contamination in Massachusetts, and that contamination of rural private water supplies with the organisms of either disease has ceased to be a public-health problem in the State. It is the purpose of the present bulletin to give information concerning some aspects of the subject of water contamination and testing which have been little known or little understood by the general public.

Efficiency of various building materials for dairy barns (*Vermont Sta. Bul.* 475 (1941), p. 28).—This report by H. B. Ellenberger briefly notes moisture-

gage studies of wooden sheathing in side walls and ceilings; tests of numerous ceiling materials, of which only the corrugated iron showed deterioration (apparent corrosion spots not red rust); work on cow-stall floorings, indicating that sawdust concrete requires much longer curing before use than does sand concrete, while the other floorings tested showed no wear after one winter of use; and trials of ventilation by electric exhaust fans, in which wide variations in the relative humidity in the barn so ventilated were discovered.

A portable charcoal kiln, using the chimney principle, A. R. OLSON and H. W. HICOCK (*Connecticut [New Haven] Sta. Bul. 448 (1941), pp. 483-513, figs. 14*).—The kilns described represent an adaptation of the chimney principle as developed by Swedish engineers to the manufacture of charcoal in a portable apparatus. The results constitute a compromise between a design which theoretically should produce the best results and one suitable to conditions in this country, in particular one which requires a minimum of expense to build and to operate.

The principal advantage in the use of the chimney in conjunction with localized air inlets lies in the fact that, once the coaling of the charge is well under way, little further attention is needed until the kiln is ready to close at the end of the burn. The use of a chimney on a four-cord, cylindrical, metal kiln was not considered satisfactory because of the considerable expense in constructing the internal duct system needed to admit air and emit smoke, and in building and charging cylindrical or dome-shaped kilns. A chimney is used on the rectangular kilns, but there is no internal-duct system other than that made when stacking the wood. Construction is consequently much simplified. One disadvantage of the rectangular shape is the care needed in order to get a good spread of fire over the rear-end panel. The wider this panel, the more attention required. It is believed that a four-cord kiln 6.5 ft. high, 5.5 ft. wide (to accommodate 5-ft. wood), and 16 ft. long would be much easier to handle than the four-cord kiln described above. Detailed bills of materials and complete sets of working drawings for both the one-cord and the four-cord kiln are included, together with full directions and time schedules for operation.

Oil filters for internal combustion engines, C. W. SMITH, T. B. JOHNSON, and E. L. MUNTER (*Nebraska Sta. Bul. 334 (1941), pp. 58, figs. 71*).—A brief introduction defines the full flow and bypass methods of installation, the various filtering principles represented by commercial filters, and centrifugal, centripetal, and parallel flow through the filtering element, and describes the various filtering materials currently used.

The filter testing equipment is described in detail. Tests using 11 lb. of oil as a standard charge are reported. Bus crankcase oil was used as the dirty oil for these tests, and the first tests were made by starting with dirty oil. Later tests were made by starting with clean oil and comparing the ability of the various filters to keep it clean while an addition to the testing unit slowly added dirty oil. Methods used for tests and analysis of the oil during test runs are described, and photographs of hourly spot tests from 1 to 20 hr. indicate the oil-clearing performances of each of 30 filters. Performance as measured by various other criteria is shown in charts and tables.

A great variation in the efficiencies of oil filters was found. Large filters were more efficient than small ones. The rate of flow of oil through filters varied greatly. In the filters tested there was no close correlation between rates of flow and filter efficiencies.

A simple dynamometer, M. A. SHARP. (Univ. Tenn.). (*Agr. Engin.*, 22 (1941), No. 1, p. 32, fig. 1).—A cable is wound around a drum made of two automobile rear-wheel assemblies with the hubs turned in and the wheels removed,

and one end is anchored to a post. As the team pulls the cart forward the cable causes the drum to rotate, the axle operating an automobile jack which tightens the brakes. The pull against compression springs operates a recording lever on the dial. The maximum pull is recorded. Continuous recording devices may be added at very little cost. Material for this instrument was obtained at a junk yard. A diagram showing its mode of operation accompanies the note.

The electric ultramicrometer circuit as a drawbar dynamometer, G. W. GILES. (Univ. N. C.). (*Agr. Engin.*, 21 (1940), No. 12, pp. 469-471, figs. 2).—The drawbar pull to be measured is made to effect a proportional separation of the plates of a condenser connected across an inductance, one-half of which (150 turns 3.5 in. in diameter) is included in the grid circuit of a three-element tube. The plate circuit includes the other half of the inductance and a milliammeter reading from 0 to 1 ma. and protected by a 0.01-a. fuse. A C battery is also connected across the meter to oppose the plate current. This is controlled by 1,000- and 10,000-ohm resistances in parallel, completing a zero shunt and permitting adjustment of the meter to zero reading. The meter having been thus adjusted, any separation of the condenser plates by drawbar pull will lower C by increasing D in the well-known relation $C = \frac{KA}{4\pi D}$, thereby raising the frequency, and concomitantly the plate current and the meter reading may be calibrated in terms of drawbar pull. A drawbar condenser weighing 15 lb. and satisfactory for the range from 0 to 2,900 lb. of pull was constructed from two heavy flat springs attached at the ends to form two simple restrained beams carrying the insulated condenser plates and having the load attached at the center. The condenser plates were of steel, about 4.75 in. square, and insulated against direct contact by shellacking their opposed surfaces. Placing the plates too close together prevented oscillation, as did also an excessive spacing (approximately 0.25 in. and over). Advantages and disadvantages of this system of measurement are discussed.

A head thresher for plant breeding studies, J. ROBERTS. (Kans. State Col.). (*Agr. Engin.*, 22 (1941), No. 1, pp. 14, 32, figs. 3).—To avoid mixing of samples it was necessary so to design the machine as to prevent throwing of corn into the air and lodging of kernels at any point inside the thresher. These requirements, and those of simplicity, ease of cleaning, durability, and portability, were met by a design using two steel pipes, the smaller one serving as the cylinder, the larger providing the concaves and framework. For the cylinder a 5-in. heavy steel pipe was selected, and for the concaves an 8-in. heavy steel pipe. Second-hand pipe could be used, as it was necessary to machine each pipe to insure proper balance and smoothness. Cast-iron end plates were used on each cylinder to insure tightness and cylinder balance. The clearance between the end plates of the large and small cylinder was $\frac{1}{16}$ in. This close fit prevented grain from sticking between the end plates. Teeth for the cylinder and concave were made from $\frac{1}{4}$ -in. steel cap screws. The location and spacing of the cylinder and concave teeth are shown, together with other constructional detail, in a dimensioned drawing and two photographs. One of the photographs shows an improvised blower separator attachment. A small feed opening and tall feed hopper provide against overloading and hand injury.

Equipment for cultivating corn, C. K. SHEDD and E. V. COLLINS. (Iowa Expt. Sta. and U. S. D. A.). (*Agr. Engin.*, 22 (1941), No. 1, pp. 5-6, figs. 5).—The time and nature of seedbed preparation was studied, and the effects upon yields resulting from the use of various machines for early cultivation were compared.

For planting from May 10 to 15, one thorough tillage with tandem disk harrow and spike-tooth harrow just before planting was sufficient to destroy weed growth. Additional tillage prior to that time did not benefit weed control nor germination and growth of the corn. For early cultivation sweeps and disk hillers were found preferable to pointed shovels for use on tractor cultivators. Sweep tracks overlap so that all weeds in the space between the rows are sheared off without deep cultivation. Sweeps were found to give less trouble than pointed shovels by clogging with cornstalks or other trash embedded in the soil. Sweeps throw less soil than do pointed shovels, but they could be adjusted to move enough soil into the corn row to cover ordinary weed growth at the first cultivation. For the last cultivation the equipment generally found most effective was one pair of disk hillers and two pairs of sweeps per row. For killing morning-glory vines, two pairs of disk hillers and one pair of sweeps per row were the most effective equipment. The front pair of disks throw soil away from the corn row, the second pair throw soil back into the corn row, and the sweeps cut the remaining space between rows. The best rear attachment for a tractor cultivator was an experimental spring-tooth weeder. This attachment consists of weeder teeth set in lines at about a 45° angle with the corn row. The teeth in this position move loose soil away from the corn row, fill tractor-wheel tracks, and leave the space between rows nearly level. They do not disturb the soil placed in the corn row to cover weeds. The weeder teeth complete the kill of weeds by raking them to the surface. By changing the spacing of the teeth for various conditions, excessive accumulation of weeds or trash on the teeth can be prevented. This weeder-tooth rear attachment was found to reduce the ridging of rows and eliminate any furrow between rows which might interfere with guiding the tractor at the next cultivation or at harvest. For check-rowed corn the reduced ridging makes the tractor and cultivator ride more smoothly and do better work in crossing ridges.

Seed corn grading in relation to planting, A. H. WRIGHT. (Univ. Wis.). (*Agr. Engin.*, 22 (1941), No. 1, pp. 18, 24).—The author finds all three dimensions of the corn seed to be related to planting accuracy and plate design and adds length grading, which is new, to grading according to width and thickness. To cover all varieties of seed produced in Wisconsin 19 grades were required, 3 length grades having been set up, although it was found that 2 length grades only were required for any one variety. Of planter plates three types are briefly discussed, the first named being the round-hole, hill-drop plate which will do fairly well with even poorly graded seed. An available plate of this type will handle with fair accuracy any of the 19 Wisconsin grades. Of the edge-drop plate it is noted that, although it is very accurate when new, it becomes inaccurate through wear of the containing rim by soil particles and through bearing wear. Of the third type, described as an enclosed-cell, single flat-drop plate, the author states that, although satisfactory accuracy is obtained with the grades for which plates are now available, the present range of plates is too limited.

Electrical weed control, E. M. DIEFFENBACH. (U. S. D. A. coop. Utah Expt. Sta.). (*Agr. Engin.*, 21 (1940), No. 12, pp. 486, 488).—The experiments here reported upon were confined mainly to rootstalks of bindweed or wild morning-glory (*Convolvulus arvensis*). The resistivity of the rootstalks of this weed ranged from 1,500 to 5,000 ohms per centimeter, the mean value being about 2,500. Soil taken from a field of the weed which had received neither irrigation water nor rain for 8 weeks showed a resistivity of from 100,000 to 200,000 ohms per centimeter, while soil having a moisture content about right for planting (18 percent) had a resistivity of from 20,000 to 25,000 ohms. It is concluded that in soil which is at all dry, current applied would follow the

rootstalks. A current of 10 ma. was found sufficient to kill any of the rootstalks tested. In terms of current density, 0.2 a. per square centimeter might be required. Slightly less of D. C. than of A. C. was required.

New developments in forage harvesting machines, F. W. DUFFEE. (Univ. Wis.). (*Agr. Engin.*, 22 (1941), No. 1, pp. 11-13, 17).—The author emphasizes the importance of the forage harvester as a final step in the development of mechanized agriculture, insofar as the three major crops outside the Cotton Belt (hay, grain, and corn) are concerned. As here used, the term "forage-crop harvesting" includes the handling of grass silage, dry hay, and straw, behind the combine. Whereas the field baler merely bales hay and straw, dropping the bales to the ground, the newer machine, which is relatively low in cost, will pick up, chop, and load hay and straw, harvest grass silage, and serve as a stationary silage cutter for corn, if not a field silage corn harvester. The author stresses the importance of devising a practical attachment converting the forage harvester into a silage corn harvester. He points out also various modifications of design which should be made in the small grass-silage harvester and features to be desired in related machines and accessories.

The drying of grasses, R. M. RAMP. (Univ. Del.). (*Agr. Engin.*, 21 (1940), No. 12, p. 472, fig. 1).—Artificial drying of immature pasture herbage in a two-tray batch drier, followed by baling, gives a product which retains most of its original green color. More dry matter can be obtained per acre per year by frequent clipping and drying than by harvesting grass as sun-cured hay, and frequent clipping of the immature grasses increases the acreage yields of protein from 40 to 50 percent over that recovered by the usual haymaking procedure. More than five times as much carotene was preserved through artificial dehydration as by field curing. Reduction of moisture in the grasses below 10 percent by artificial drying is valueless. Loss of carotene during the storage in bales is most rapid during the first few months, particularly in hot weather, and averaged 50 percent during the 10-mo. experimental period, but the final product still contained from two to five times as much carotene as was found in hay at time of storage. The results obtained from the artificial drying of grass are very favorable, but the equipment cost at the present time makes it prohibitive as a universal practice in Delaware. One may reasonably expect, however, enough improvement in the grass-drying equipment and methods to overcome the present high cost of drying grasses.

Research work in wheat storage, C. F. KELLY. (U. S. D. A.). (*Agr. Engin.*, 21 (1940), No. 12, pp. 473-475, 476).—Work on bin construction and ventilation and on drying of grain before storage, carried out in cooperation with various State experiment stations, is summarized. A fuller account of some of the work on bins and bin ventilation at the North Dakota Station has been noted (E. S. R., 86, p. 101), and a drier developed at the University of Maryland is described below. Another type of machine, developed by the U. S. Department of Agriculture, heats the grain by direct contact with the inside of a drum revolving in a heated oven. The wet wheat, heated to a temperature of about 140° F., passes by gravity down between two screens spaced about 6 in. apart, where it receives a blast of cool air. The wheat is in the air flow for a period of from 8 to 10 min., in which time it is both cooled to air temperature and dried. The experimental model, mounted on a truck, will dry 16-percent wheat to 14 percent at the rate of 100 bu. per hour. Oil is used for fuel.

Engineering problems in grain storage, G. J. BURKHARDT. (Univ. Md.). (*Agr. Engin.*, 21 (1940), No. 12, pp. 485, 488, figs. 3).—A relatively humid climate makes dry wheat at harvest difficult or impossible and creates a storage problem. The investigation here reported upon has indicated that (1) no

ordinary structure will safely store high moisture-content wheat, (2) additions of preservatives do not appreciably improve the keeping quality of wheat, though the addition of lime and sulfur has kept a bin of 15-percent wheat from souring since 1937 while similar wheat without the addition turned sour in the spring of 1938, and (3) ventilation properly installed will aid in keeping such wheat but it is doubtful whether the expense and inconvenience of the ventilating system are justified considering the results obtained in the humid climate of this region. A new grain drier was therefore developed. It is compact enough to provide reasonable capacity in a portable machine. In its elementary parts this drier consists of a grain hopper, an air vent, several extended surface heating coils with a diffusion space between them, a cooling space, screened air inlets, an air-resistance leg, and a variable discharge mechanism. Auxiliary equipment includes a fan, a hot water supply, and a suitable power for driving the equipment. A machine of this basic design can be built to any size and capacity desired. For the 1939 harvest a portable unit having a coil-face area of 8.25 sq. ft. was built. A loading elevator and bagger reduce the labor required to a minimum. In this machine air vents, screened air inlets, and discharge mechanism are in multiple to eliminate funneling. By varying the rate of discharge, the moisture reduction can be adjusted to the needs of the lot of grain. One lot of wheat was dried from 24.2 to 16.4 percent moisture at 24 bu. per hour. Another was dried from 18.5 to 14 percent at 40 bu. per hour. From 24 to 120 bu. per hour can be handled, depending on the moisture reduction required.

Results of investigations of milk cooling, J. ROBERTS and G. H. LARSON (*Agr. Engin.*, 21 (1940), No. 12, pp. 465-467, 471, figs. 12).—The information here presented was obtained from answers to a questionnaire prepared by the Kansas State College and the Kansas Committee on the Relation of Electricity to Agriculture and the results of a survey covering more than 1,000 individual producers. Of the producers covered by the survey, 25 percent were classed as Grade A, 74 percent as Grade B, and 1 percent as Grades C and D. Electricity was available to 67 percent, but only 20 percent used mechanical milkers. No milk-cooling method was used by 24 percent of the producers, well water (of a mean temperature from 56° to 64° F.) by 40 percent, and mechanical refrigeration by 24 percent. Of the mechanical refrigeration 28 percent was wet storage, 48 percent dry box, and 24 percent dry walk-in box. Field and laboratory tests of cooling rates made by means both of thermometers and of thermocouples are also reported.

Cold air was found nearly worthless for cooling milk in 10-gal. cans. Water at 60° or below may be considered satisfactory for producing Grade B milk. In using well water for cooling 10-gal. cans, the cooling rate may be doubled by stirring the milk three times during the first hour. The average quantity of ice required for cooling 100 lb. of milk in producing Grade A was 107 lb. and Grade B 41 lb., during July and August 1939, these averages being those of the consumption of four producers of each grade. In wet storage a six-times increase in cooling rate was obtained by agitation of the cooling water. In a 4-in. concrete storage tank the power consumption was reduced by 50 percent by the use of suitable insulation. The operating costs of wet storage may be reduced by from 25 to 40 percent by operation at rated capacity. Suitable methods being used, milk of very low bacterial count can be produced by ice cooling. The cost of cooling milk was least in wet storage and most expensive in ice cooling. Power required in cooling milk can be reduced from 18 to 32 percent by running water at 60° through the top half of the tubular surface cooler. Power required to keep the wet storage box cool varied from

20 to 28 percent of the total required at rated capacity of the cooler. Electric mechanical refrigeration was the most satisfactory method for cooling milk.

Farm buildings in land-use planning, W. A. ROWLANDS. (Univ. Wis.). (*Agr. Engin.*, 22 (1941), No. 1, pp. 25-26, fig. 1).—This mainly economic discussion is based on phases of the farm-building problem brought out by county planning committee reports from three Wisconsin counties. The Kenosha County report points out that changes in production methods have resulted in making the average dairy or general farm an awkward unit, too large for one man but too small for two men. The minimum arable acreage should be 70, and if equipment and labor are available, 160 acres is considered a more suitable size. The Barron County report notes increased living, production, and marketing costs, together with higher taxes, without proportionate increases in prices obtainable. There has also been a serious loss of soil fertility, the replacement of which will mean additional and substantial cash outlay. The Marinette County report recommends, as a part of a well-managed northern Wisconsin farm, a selectively managed wood lot to provide all necessary dimension timber and finished lumber, and suggests also the need for portable sawmills and planers of improved accuracy and efficiency. The author points out the functions and responsibilities of the agricultural engineer indicated by the findings of these committees.

AGRICULTURAL ECONOMICS

Papers and proceedings of the fifty-third annual meeting of the American Economic Association (*Amer. Econ. Rev.*, 30 (1941), No. 5, pp. XVI-458, pls. 5, figs. 29).—Included are the following main and review papers with discussion on Agriculture in The American Economy and other economic subjects, presented at the meeting at New Orleans, December 27-30, 1940: An Appraisal of the National Interest in the Agricultural Situation, by H. R. Tolley (pp. 108-126) (U. S. D. A.); Economic Effects of Agricultural Programs, by T. W. Schultz (pp. 127-154) (Iowa Expt. Sta.); The Farmer is Dependent on National Programs, by B. H. Hibbard (pp. 155-164); Measures for the Improvement of Agriculture, by J. D. Black (pp. 165-176); The Price Level and the Gold Problem, by H. P. Neisser (pp. 1-17); The Price Level and the Gold Problem—Retrospect and Prospect, by C. O. Hardy (pp. 18-29); Eight Questions on Gold—A Review, by F. Machlup (pp. 30-37); Comments on Gold and the Monetary System, by W. A. Brown, Jr. (pp. 38-51); Deficit Spending, by J. H. Williams (pp. 52-66); The Federal Budget—Economic Consequences of Deficit Financing, by B. F. Haley (pp. 67-87); Economic Consequences of Deficit Financing—A Review, by D. T. Smith (pp. 88-98); Direct Versus Fiscal and Institutional Factors, by L. H. Seltzer (pp. 99-107); Consumption—A Vast Underdeveloped Economic Frontier, by T. J. Kreps (pp. 177-199); Prices, Costs, and Investment, by R. M. Bissell, Jr. (pp. 200-227); Private Investment, Full Employment, and Public Funds, by O. L. Altman (pp. 228-236); Savings, Investment, and Consumption, by I. de Vegh (pp. 237-247); Unemployment in the United States, 1930-40, by P. Webbink (pp. 248-272); Unemployment—Analysis of Factors, by O. Morgenstern (pp. 273-293); The Economists and Unemployment, by E. W. Bakke (pp. 294-300); An Economic Foreign Policy for America, by P. T. Ellsworth (pp. 301-319); Some Aspects of Our Foreign Economic Policy, by L. Pasvolsky (pp. 320-337); United States in the World Economy, 1940—A Summary, by E. M. Patterson (pp. 338-343); War and Inflation Since 1790 in England, France, Germany, and the United States, by H. Oliver (pp. 344-351); Postwar Depressions, by W. L. Thorp (pp. 352-365); Some Aspects, Near-Term and Long-Term, of the International Position of the

United States, by A. H. Hansen and A. R. Upgren (pp. 366-372) (Univ. Minn. et al.); Some Economic Problems in the Expansion of Capacity to Produce Military Goods, by T. O. Yntema (pp. 373-378); Major Controversies as to the Criteria of Reasonable Public Utility Rates, by J. C. Bonbright (pp. 379-389); and Concentration and Product Characteristics as Factors in Price-Quantity Behavior, by W. L. Thorp and W. F. Crowder (pp. 390-408).

Also included are the remarks of Davis Rich Dewey at the testimonial dinner in his honor, summaries of the papers at Round Table Conferences on Economic Research by P. T. Homan and on Problems in the Teaching of Economics by R. H. Blodgett, and the reports of officers and committees.

[Proceedings of the thirty-first annual meeting of the American Farm Economic Association] (*Jour. Farm Econ.*, 23 (1941), No. 1, pp. [4]+398, figs. 18).—Papers, with discussions, presented at the meeting held at New Orleans, La., December 27-29, 1940, are included as follows: Newly Developing International Situation and American Agriculture, by O. B. Jesness (pp. 1-14) (Univ. Minn.); Social Effects of the War and the Defense Program on American Agriculture, by R. C. Smith (pp. 15-27) (U. S. D. A.); American Agriculture in the New War and Defense Situation, by J. D. Black (pp. 28-36); Some Current Problems in Agricultural Credit, by A. G. Black (pp. 37-51) (U. S. D. A.); The Function of Credit in Modern Agriculture, by E. C. Young (pp. 52-70) (Purdue Univ.); Methods of Wage Determination in Agriculture, by M. R. Benedict and R. L. Adams (pp. 71-88) (Univ. Calif.); Changing Structure of Agriculture and Its Impacts on Labor, by J. A. Hopkins (pp. 89-111) (Iowa Expt. Sta.); Future of Cotton in the Economy of the South, by O. C. Stine (pp. 112-137), and The Expanding Scope of Agricultural Economics, by H. G. Porter (pp. 138-144) (both U. S. D. A.); Reconsideration of Rent Theory as It Applies to Agricultural Land, by C. H. Hammar (pp. 145-160) (Univ. Mo.); Institutional Economics in Land Economic Theory, by G. S. Wehrwein (pp. 161-172) (Univ. Wis.); Legal Aspects of Land Tenure, by M. Harris (pp. 173-184) (U. S. D. A.); Effect of Tenure Systems on Agricultural Efficiency, by R. Schickele (pp. 185-207) (Iowa State Col. and U. S. D. A.); Progress of Tenure Groups, by H. Hoffsommer (pp. 208-217) (La. State Univ.); Orientation of Farm-Management Research to Low-Income Farms, by S. E. Johnson and D. R. Rush (pp. 218-245), Objective Sampling in Estimating Southern Crops, by D. A. McCandliss (pp. 246-255), and Problems in Estimating Texas Citrus Fruit, by V. C. Childs (pp. 256-265) (all U. S. D. A.); Highlights of the 1940 Census, by Z. R. Pettet (pp. 266-276); Status and Appraisal of Research in Farm Tenancy, by J. Ackerman (pp. 277-290); Needed Research in Farm Tenancy, by M. M. Kelso (pp. 291-310) (U. S. D. A.); Application and Uses of the Graphic Method of Multiple Correlation, by H. R. Wellman (pp. 311-316) (Univ. Calif.); Place of, and Limitations to the Method, by W. C. Waite (pp. 317-323) (Univ. Minn.); Problems of Graduate Students in Rural Social Sciences (pp. 324-328); Quality-Price Differentials in Cotton Marketing, by L. D. Howell (pp. 329-338) (U. S. D. A.); and Seasonal Patterns in Tobacco Prices, by C. M. Clark (pp. 339-361) (Univ. Ky.).

The reports of the officers and committees of the association are included.

[Papers and notes on rural economics] (*Jour. Farm Econ.*, 23 (1941), Nos. 2, pp. 399-501, figs. 4; 3, pp. 537-671, figs. 7).—No. 2 includes papers on: Some Neglected Aspects of the Wool Duty, by F. W. Fetter (pp. 399-420); An Investigation on Complementarity Relations Between Fresh Fruits, by S. Hoos (pp. 421-433) (Univ. Calif.); Length of Haul and Farm Commodity Prices, by F. L. Barton (pp. 434-445); Farmers in a Changing World—The 1940 Yearbook of Agriculture, I, by M. G. Reid (pp. 446-450) (Iowa State Col.); II, by D. O.

Hammerberg (pp. 451-453) (Univ. Conn.); and III, by L. J. Norton (pp. 454-455) (Univ. Ill.); Organizational Problems of Agricultural Labor Unions, by H. Schwartz (pp. 456-466); A Neglected Point in the Economics of Soil Conservation, by G. Lange (pp. 467-474); A Neglected Point in the Economics of the Soil—A Reply, by A. C. Bunce and W. W. Wilcox (pp. 475-477) (Iowa State Col.); and Migration and Resettlement in the Far Western States, by D. McEntire (pp. 478-482) (U. S. D. A.). Notes are included on: Some Aspects of the Food Stamp Plan as Applied to Consumption of Fats, by A. Kozlik (pp. 483-492) (Iowa Expt. Sta.); An Experiment on the Accuracy of Farm Survey Data, by J. A. Hopkins (pp. 492-496) (Iowa State Col.); Price-Quality Relations in the Cotton Market of Victoria, Texas, by W. E. Paulson (pp. 496-499) (Tex. A. and M. Col.); and Comments on Sampling to Increase the Usefulness of Farm Management Research, by E. B. Hill (pp. 499-501) (Mich. State Col.).

No. 3 includes papers on: Control in the Sugar-Cane Industry of South Africa, by J. M. Tinley and B. M. Mirkowich (pp. 537-549) (Univ. Calif.); Long-Term Forecasting of Fruit and Nut Production, by M. Clawson, C. P. Heisig, and E. B. Hurd (pp. 550-566) (U. S. D. A.); Margarine Legislation, by W. T. Mickle (pp. 567-583) (Tex. A. and M. Col.); Indexes on a Type-Farm Basis, by W. Malenbaum (pp. 584-606); Sources and Distribution of the Farm Population in Relation to Farm Benefit Payments, by T. L. Smith and R. W. Roberts (pp. 607-618) (La. State Univ.); Export Subsidies and Agricultural Income, by R. S. Nelson (pp. 619-631); and Expectation and Performance—Related to Conservation and Production Adjustments in the Midwest Dairy Region, by R. P. Christensen (pp. 632-645) (U. S. D. A.). Notes included comments by R. E. Moody and reply by A. C. Bunce (Iowa State Col.) to papers by Bunce previously noted (E. S. R., 84, p. 255) (pp. 646-653); reply by A. Kozlik (Iowa Expt. Sta.) to a paper by S. Hoos, noted above (pp. 654-656); Land Classification, Land-Use Areas, and Farm Management Research, by C. A. Boonstra and J. R. Campbell (pp. 657-664) (La. State Univ.); Wheat Yield Insurance, by D. E. McCarty (pp. 664-667); and Correlation Analysis of Farm Land Values, by J. P. George (pp. 668-671).

[Investigations in agricultural economics by the New Hampshire Station, 1940]. (Partly coop. U. S. D. A.). (*New Hampshire Sta. Bul.* 330 (1941), pp. 15-18, 18-20).—Brief general findings not previously noted are included as follows: (1) Number and size of dairy herds and relative opportunities for commercial dairying in four areas of the State, by H. C. Woodworth and J. C. Holmes; (2) number of hours of labor and gallons of spray used per mature trees, based on calyx spray records on 43 farms for 162 orchard years, by Woodworth; (3) preliminary data as to the relation of liabilities to total assets of 100 dairymen in the wholesale milk areas of the State, studied by B. Peterson; (4) general information as to extent and possibility of farm woodlots in Coos County, by J. M. Chandler; and (5) some possible savings to farmers through purchasing feeds, fertilizers, coal, and oil by ordering in large lots, paying in advance, and taking delivery in large quantities, by L. A. Dougherty.

[Investigation of agricultural economics by the North Dakota Station]. (Partly coop. U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 1, pp. 13-16).—The findings as to assessed valuation, tax delinquency, county expenditures and indebtedness, cost per pupil in elementary schools, township expenditures, etc., in a study in Burke County, made by M. H. Taylor, are briefly summarized. The usual table by W. L. Ettesvold of average prices received by North Dakota farmers shows the average prices and price relations for 14 products on August 15, 1941, with comparisons with July 1941, August 1940, and the average for 1910-14.

Current Farm Economics, [October 1941] (*Oklahoma Sta., Cur. Farm Econ.*, 14 (1941), No. 5, pp. 129-160, figs. 4).—In addition to the usual discussion of the agricultural situation and the index numbers, articles are included on Oklahoma Agricultural Production Goals for 1942, by L. S. Ellis (pp. 135-142); Why Not Buy Just the Surface? by L. A. Parcher (pp. 146-151), which discusses the operation of surface and subsurface ownership of land; and Principles of Agricultural Cooperation, by A. L. Larson (pp. 151-155). Using data for 72 Garfield County farms for 1938 and 47 farms in 1940, analysis is made by P. Nelson and R. Edwards of the fixed and variable costs, income, and net profits for all the farms and the 16 most and 16 least profitable farms each year.

[Articles on agricultural economics pertaining to Wales] (*Welsh Jour. Agr.*, 16 (1940), pp. 17-98).—Included are the following: The Labour Requirements of the Ploughing-Up Campaign in Wales, by J. H. Smith (pp. 17-26); Changes in Production of Milk and in Certain Items of Production Costs on Nineteen Farms in Wales for October-March, 1938-9 and 1939-40 (pp. 34-45), and Financial Results on Sixty-Three Farms in Wales (1937-8 and 1938-9) (pp. 45-59), both by J. P. Howell; Agricultural Workers' Budgets, by J. R. E. Phillips (pp. 60-69); Costs of Tractor Work (pp. 70-75); Distribution of Profits by Agricultural Co-Operative Societies in Wales (pp. 76-80), and Some Legal and Political Implications of Government Guarantees for Farmers (pp. 81-91), both by W. H. Jones; and The Cost of Grazing on Welsh Farms, by J. D. Griffiths (pp. 91-98).

[Papers on farm management and appraisal of rural lands] (*Jour. Amer. Soc. Farm Mgrs. and Rural Appraisers*, 5 (1941), No. 1, pp. [2]+80, figs. 10).—Included are the following papers presented before the American Society of Farm Managers and Rural Appraisers at Chicago, December 2-3, 1940: Measuring the Effect of Soil Management Practices upon the Productivity of Farm Land, by J. A. Slipher (pp. 8-14) (Ohio State Univ.); Field Method for the Estimation of Soil Textures, by J. A. Hobbs (pp. 24-31); Problems in Ranch Appraisal, by B. Sifton (pp. 32-37); Possible Effects of Improved Moisture Conservation Practices upon the Productivity and Value of Land, by F. L. Duley (pp. 39-52) (U. S. D. A.); Land Classification as an Appraisal Aid, by A. A. Dowell (pp. 53-58) (Univ. Minn.); and What We Can Learn from Appraisal Studies, by R. H. Cole (pp. 64-70) (U. S. D. A.).

Other papers included are The Function of Credit in Modern Agriculture, by E. C. Young (pp. 15-23) (Purdue Univ.) (see page 400); and The Soil as a Farm Commodity or a Factory, by W. A. Albrecht (pp. 59-63) (Univ. Mo.), presented at the Conservation Conference, Columbia, Mo., June 28, 1940.

The cotton-and-tobacco South (*U. S. Dept. Agr., Misc. Pub. 474* (1941), [pp. 19, figs. 45]).—This is a popular bulletin describing briefly the soil conservation needs of the 13 cotton-and-tobacco States of the South, and methods for correction of soil erosion.

Farm ownership, tenancy, and land use in a Nebraska community, R. DILLER (*Chicago: Univ. Chicago Press*, [1941], pp. VII+192, [figs. 11]).—This study of the community surrounding Diller, Nebr., was made in 1937. The chapters deal with the natural background; speculators and settlers; the economic background; the development of stable tenure; functional tenancy; and roads, farms, and fields.

The agricultural land market and its control, G. COSTANZO (*Internatl. Rev. Agr. [Roma]*, 32 (1941), No. 5, pp. 133E-156E).—The characteristics of the land market, the formation of land prices, the tendencies of the evolution of the land market in the United States, the Netherlands, Belgium, and France, and the government actions for the control of the land market in Germany, Switzerland, the Netherlands, and Italy, are discussed.

Farm taxes and the cost of public services in relation to land resources in Ringgold County, Iowa, J. L. SPAULDING. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul.* 288 (1941), pp. 317-394, figs. 5).—The objectives of this report are: "To measure the burden of taxes on farm property; to analyze the process of assessment and its relation to the unequal incidence of the tax burden; to investigate the possibility of local school reorganization in the interest of relieving the tax burden and to appraise the need for State aid for schools in the area; to point out the need for improved road facilities; to examine the effect of homestead credit as a device for tax relief on farm property; [and] to indicate the implications of local public finance problems for other socioeconomic relationships affected in the readjustment in land use." It is based on a survey of 172 separate ownership tracts in three townships of the county, and most of the data are for the 1938 crop year. The characteristics of the land resources, their utilization, and the cost of public services are described. Analysis is made of the relation of taxes to gross rent, the agricultural conservation payments on rented land, the relief from tax burden through the credit allowed on homesteads, the mortgage indebtedness and interest payments, and the relation of assessments on farm real estate to farm appraisals and agricultural conservation productivity ratings. The road situation—mileage, surface conditions, expenditures, etc., and also the present school situation including the adjustments, reorganization, combination, and State aid needed are discussed.

For the 172 farms studied the average gross rent per acre was \$1.65 and the taxes 82 ct. The averages for the 40 farms in the lowest rent group (\$1 or less per acre) were 64 and 66 ct., respectively, and for the highest rent group (\$2.51 and over) \$2.91 and \$1.09, respectively. Some farms were assessed at twice, and others at only two-thirds, of their equitable value. Overassessment was especially conspicuous on the poorer grades of land where the greatest depreciation in values has taken place. Homestead credit relieved the tax burden to the greatest extent on small farms, where it covered almost one-half to three-fourths of the total tax. The average tax reduction averaged 30 percent on the farms receiving it, but only about 31 percent of the total taxable acreage is aided by homestead credit. It is estimated that the landlord's share of the agricultural conservation payments amounted to about one-fourth of his gross rent, or about one-half of his tax bill. School districts levied 44 percent of the total taxes in 1937. Decline in number of pupils in both rural elementary schools and in the grades in town and consolidated schools has resulted in higher costs per pupil. High school enrollments have been kept up by increasing numbers of rural children attending, but transportation charges per pupil were high. Economical and more widespread transportation awaits improvement in roads. State aid to schools is needed to equalize more nearly the opportunities of children of the different areas and overcome the handicap brought about by wide variations in the productivity of the lands. The present road facilities do not provide regular access to markets. In 1933, more than 60 percent of the total expenditures by the county was for secondary roads, but only 16 percent of the road mileage was surfaced, thus leaving 84 percent impassable by motor cars during intermittent periods of the year. "The legal limits on millage for road purposes should be raised so as not to hinder road development. However, in view of an expected further decline of the already overburdened tax base, effective and speedy improvement of the secondary road system requires a substantial increase in State (and possibly Federal) aid for farm-to-market roads. From the social viewpoint, such aid, if properly administered and allocated, would represent a good investment, as it would directly facilitate necessary land use adjustments and thereby maintain and possibly increase the land's income-yielding capacity and the tax base."

Annuaire international de législation agricole [International yearbook of agricultural legislation] (*Inst. Internatl. Agr. [Roma], Ann. Internatl. Lég. Agr.*, 30 (1940), pp. LXXIV+762).—This volume continues the series (E. S. R., 83, p. 552). It includes the text of the more important laws enacted and decrees, orders, etc. promulgated, and references showing the titles, dates, official publications in which published, etc., for those of secondary importance. A chronological list by countries of legislation, etc., in 1939 and 1940, and an alphabetical list by subjects are included. In the introductory section (pp. XVII-LXXIV), the measures for codification of legislation pertaining to agriculture, for State intervention in the operation and transfer of lands, the amelioration of agricultural conditions, colonization, the creation and protection of small holdings, the consolidation of holdings, agricultural credit and wages, are discussed.

Agricultural labor research: Proceedings of the Conference on Research Relating to Labor in Agriculture, held in Berkeley, California, in March 1940, edited by W. S. HOPKINS (*Stanford University: Social Sci. Res. Council*, 1940, pp. VII+67).—Included are a paper entitled Research Needs in the Field of Agricultural Labor, by J. D. Black (pp. 1-4), and discussions on the following topics: Types of agricultural labor, changes in farm structure which affect agricultural labor, migration of agricultural labor, the law with respect to agricultural labor, welfare and farm labor, and the formulation of research programs.

World wheat survey and outlook, September 1941, H. C. FARNSWORTH and B. M. JENSEN (*Wheat Studies, Food Res. Inst. [Stanford Univ.]*, 18 (1941), No. 1, pp. [2]+1-36, figs. 6).—"Heavy British takings of overseas wheat in the last quarter of 1940-41 brought world exports for the crop year to about 490 million bushels. . . . After allowance for sinkings of less than 10 percent, and for some diversions, British imports may have approximated 240 million bushels. Such imports presumably permitted expansion of British year-end wheat reserves to a record level. In contrast, imports into the Axis-dominated area were notably light, and wheat carry-overs throughout that territory were considerably reduced. In the major exporting countries, wheat-surplus problems continue pressing. Old-crop stocks on August 1 were unprecedentedly large in Canada, in North America, and in the four chief exporting countries combined. . . . Prices have changed little since May, except in the United States; here a rise of 30 ct. mainly reflected transition from a basic loan rate of 64 ct. last year to 98 ct. in 1941-42. Unless large wheat shipments are sent to relieve distress in Russia or elsewhere, world exports seem likely to be smaller under continued war this year than in 1940-41—perhaps no more than 400 to 450 million bushels. Much will depend on Britain's import policy and the international status of Spain. Bread-grain supplies within the Axis area appear to be about the same size this year as last. Unless German-sponsored imports are obtained, serious shortages may develop in Greece, Belgium, and Norway, and possibly in the Netherlands, Finland, and Poland."

An economic study of truck farming in Copiah County, Mississippi, 1938-1940, M. GUIN and D. W. PARVIN (*Mississippi Sta. Bul.* 361 (1941), pp. 35, figs. 11).—Survey records on 80 farms were obtained. Analysis was made of the land use investments, acreage of principal crops, receipts, expenses, value of farm privileges, profits, and the factors affecting profits. Commodity studies were made for cabbage, tomatoes, peas, beans, and cotton. Brief statements are included as to the use of long- and short-term credit and accounting.

The average farm included 131 acres with 55 acres in crops. The average investment for the 3 yr. ranged from \$1,198 to \$4,950. Of the average cropped acreage, 22.5 acres were in corn, 7.3 in cotton, and 21.2 in truck crops (from 16 to 20 acres were double-cropped). The labor income per farm was \$50 in 1938,

\$54 in 1939, and —\$55 in 1940. That for a majority of the farms ranged from —\$250 to \$250. Marketing efficiency and production efficiency were the most important factors causing variations in incomes. Size and balance of business had no constant effects. The profitableness of individual truck crops varied greatly from year to year, and a different crop was most profitable in each year studied.

The average returns per acre, to labor per acre, and per day of labor were: Cotton \$5.26, \$17.61, and \$1.43; cabbage \$2.16, \$13.62, and \$1.18; peas —\$4.84, \$8.01, and 66 ct.; beans —\$6.60, \$3.53, and 35 ct.; and tomatoes —\$14.26, \$4.92, and 26 ct.

Costs and returns for the cabbage enterprise, 1938 and 1939, R. W. HOECKER ([*New York*] *Cornell Sta. Bul.* 759 (1941), pp. 60, figs. 6).—Records of costs of producing and marketing cabbage and the labor incomes were obtained for 100 Onondaga County farms for the crop year 1938, and 70 for the year 1939. Sixty-two of the farms grew cabbage both years. Analysis is made of the growing, harvesting, and marketing costs, returns and gains or losses, and also of the factors affecting costs and returns. The marketing of the crop—use of crop, sales and prices by months, place of delivery and type of transportation, and type of buyer and package are discussed.

The average acreage of cabbage per farm and the average yield per acre in 1938 were 7.1 acres and 14.76 tons, and 5.9 acres and 7.04 tons in 1939. The average total costs in 1938 were \$89.47 per acre or \$6.59 per ton, and in 1939 \$70.91 per acre or \$10.19 per ton. The total returns were \$61.64 per acre or \$4.54 per ton in 1938, and \$96.62 per acre or \$13.89 per ton in 1939. Important factors affecting yields are climate, crop rotation, quality of seed, amount of fertilizer used, and date of setting. In 1938, the group of farms with less than 4.5 acres of cabbage had a loss of \$2.43 per ton, those with 4.5-7.9 acres a loss of \$1.27 per ton, and those with 8 acres or more a loss of \$1.99 per ton. In 1939, growers with less than 5 acres had a gain of \$2.23 per ton, and those with 5 acres or more a gain of \$4.06 per ton. Type of cabbage grown made little difference in returns for labor in either year.

Farm organization and costs and returns in producing potatoes on farms in the St. John River Area of Aroostook County, Maine, 1937, W. E. SCHRUMPF (*Maine Sta. Bul.* 406 (1941), pp. [41]+82, figs. 19).—Information as to the farm business, and especially the potato enterprise, was obtained on 241 farms by the survey method. Analysis is made of the amounts, distribution, and variations in capital; receipts, expenses, and income for the farms; the costs of producing, harvesting, storing, and selling potatoes; the returns from potatoes; and the effects of different farm-business efficiency features on costs and income.

The average size of farms was 165 acres, of which 79 were in crops, 18 being in potatoes, 25 in grain, 29 in hay, and 7 in green manure crops, beans, peas, green feed, turnips, etc. The average net income including farm products used in the home, including an allowance for house rent, was \$170, the farm income —\$779, the labor income —\$1,196, the labor earnings —\$646, and the family labor earnings —\$247. The return on capital averaged —\$1,543 per farm. Using the average price of potatoes for the 10 yr. prior to 1937, the farm income would have been \$364, the labor income —\$53, labor earnings \$497, and the family labor income \$896. The average cost for potatoes per acre and per barrel was: Growing, \$78 and 68 ct.; harvesting, \$13 and 12 ct.; storing, \$17 and 15.3 ct.; and selling, \$148 and 4 ct. (per barrel harvested and 5 ct. per barrel sold). The gross returns were nearly \$78 per acre, \$67 being for potatoes sold and \$11 for potatoes used on the farms. The net loss was

nearly \$35 per acre or 31 ct. per barrel harvested. With the 1927-36 average price, there would have been a gain of \$29 per acre. The 1937 labor income decreased, but labor income adjusted to the 10-yr. average price of potatoes increased as size of farm business increased. An increase of 41 bbl. per acre in potato yield increased the adjusted labor income \$215 and decreased the cost of production 22 ct. per barrel on farms having less than the average size of business, and increased the income \$1,244 and decreased the cost per barrel 24 ct. on the farms above the average. An increase of 667 bbl. per man increased labor income \$567. An increase of 890 bbl. per man increased the labor income \$1,305. A decrease of 6.9 yr. in the time required for farm receipts to equal farm capital was associated with an increase of \$458 in the labor income and a decrease of 8.6 yr. with an increase of \$1,592 in the labor income. An increase of 32.7 points in the percentage of total receipts from potatoes increased the labor income \$48 on small farms. On large farms an increase of 21.1 points was associated with a \$463 increase in the labor income. The farms above the average in size of business, yield rate of potatoes, labor and capital efficiency, and farm balance, as compared with all farms, had 15 more acres of potatoes, 155 more productive-man-work units, 23 more crop acres, 0.5 more productive-animal units, a 23-bbl. higher yield of potatoes per acre, a productive index 15 points higher, 763 bbl. more potatoes produced per man, 23 more productive-man-work units per man, 3 more acres of crops per man, and required 3.5 less years for the farm receipts to equal farm capital.

Handling and marketing Iowa sweet potatoes, A. T. ERWIN, G. SHEPHERD, and P. A. MINGES (*Iowa Sta. Bul. P32, n. ser. (1941), pp. 73-103, figs. 5*).—The production of sweetpotatoes in Iowa; the influence of competing areas, seasonal price variations, transportation, prices in Iowa and competing areas, geographical distribution of Iowa shipments and consumption on marketing Iowa sweetpotatoes; handling and marketing—bulk marketing containers, consumer packages, and overweighting baskets; grading; use of culls; branding shipments; storage problems including effects of fertilizers on storage quality and of storage on flavor, and sanitation; factors affecting marketability—rainfall, temperature, time of harvest, and effect of fertilizers on sugar content and shape of roots; and varieties including comparison of yields and consumer preferences are discussed.

The study showed that the most marked advance in prices usually occurs during November and December, and then prices remain fairly constant during the remainder of the marketing season; temporary storage until about December permits growers to realize on the price advances and to avoid the hazards of shipment in severe winter weather; price advances after December are not sufficient to warrant storage for the late winter market; and returns can be improved by temporary storage, grading, branding, advertising, improvement in packaging, and use of culls for stock feed.

Cotton marketing in South Carolina, W. T. FERRIER and H. A. WHITE (*South Carolina Sta. Bul. 335 (1941), pp. 28, figs. 4*).—This study deals with the marketing of the 1939-40 crop. It analyzes and discusses the price-quality relationships, the losses resulting from gin damage, the price variations due to transportation costs and to quality, and the production and the demand and supply situation in the State. Data were obtained from the U. S. D. A. Agricultural Marketing Service on grade and staple of cotton ginned in the State and the number of bales receiving a lower grade due to poor ginning preparation for 45 gins in representative areas. Price data were obtained by tracing individual bales through the books of the ginners and buyers in four markets selected as fairly

representative of different producing areas and of the more important types of primary markets. Price relationships were computed on the basis of premiums and discounts and the spot price existing in the Augusta, Ga., market on the day on which each bale was sold. A method for identifying growers of high or low quality cotton is outlined.

The study corroborated findings in other studies of the South Carolina and other State experiment stations and of the U. S. Department of Agriculture that prices paid in local markets are usually average or "round-lot" prices and do not reflect differences in quality of individual bales; that differences of quality as between growers are frequently not recognized; and that growers of poor quality cotton are often overpaid while growers of high quality cotton are underpaid. Differences ranging up to \$5 per bale were paid in the same market on the same day for cotton identical in class. Variations in price were more often for differences in staple than for differences in grade. Of 2,006 bales from 328 gin patrons in two communities, 246 bales were short cotton ($3\frac{1}{32}$ in. or shorter). While 31 percent of the patrons grew some short cotton, only 9.5 percent grew three bales or more of such cotton, but these producers produced 56.1 percent of all the short cotton.

Losses from gin damage averaged \$3.49-\$4.42 per bale of the cotton so damaged in the four markets studied. Due to proximity to mills, South Carolina growers received 50-75 points above the central market prices and 120 points over Oklahoma and Texas local market prices. "When both grade and staple are considered, the 1939 South Carolina crop was worth bale for bale practically the same as Texas or Oklahoma cotton. Premiums which South Carolina cotton earned for its longer staple were offset by discounts due to its lower grade." During the period 1928-40, the harvested acreage of cotton in the State decreased 47.8 percent, but due to increasing yields the total production was fairly uniform throughout the period. The proportion of staple of $\frac{1}{8}$ in. or less dropped from more than 60 percent to less than 5 percent, and that of 1 in. or longer increased from less than 20 percent to over 72 percent. Consumption in the State of all staples collectively exceeds production by more than 50 percent, but production of $1\frac{1}{16}$ - and $3\frac{1}{32}$ -in. staples was slightly greater than the consumption. Because of requirements as to quality, the consumption in the State is hardly one-third of the production.

Economic trends in livestock marketing, S. H. THOMPSON (*St. Louis, Mo.: John S. Swift Co., [1940], pp. 2+VII+174, figs. 31*).—The material is presented in chapters on the problem, recent changes in livestock marketing, increase of livestock income by effective marketing, developing effective organization for cooperative livestock marketing, and summary and conclusions. It applies particularly to Iowa, and special emphasis is placed on cooperative livestock marketing. A selected bibliography is included.

The farm price of tobacco in Puerto Rico from 1907 to 1940, J. J. SERRALLÉS, JR., and M. VELEZ, JR. (*Puerto Rico Univ. Sta. Bul. 60 (1941), pp. [2]+38, figs. 13*).—A translation by C. E. Gage of the Spanish edition previously noted (*E. S. R., 86, p. 116*).

The frozen food industry, H. CARLTON (*Knoxville: Univ. Tenn. Press, 1941, pp. [8]+187, figs. 38*).—Included is the more important information contained in Tennessee Experiment Station Bulletin 173 (*E. S. R., 85, p. 551*).

The demand for milk and cream as revealed by consumer purchases at retail food stores in New York City, C. J. BLANFORD. (*Coop. U. S. D. A. [New York] Cornell Sta. Bul. 765 (1941), pp. 47, figs. 10*).—Since retail food stores in New York City distributed more than half the milk purchased for home consumption, a survey was made of the daily sales in June 1938, June 1939,

and April 1940 in approximately one-fourth of these 18,000 stores distributed in low-, medium-, and high-income areas. Information was also obtained as to the demand for paper containers and for delivery service on the part of the families who purchased their milk principally at stores.

Daily sales, chiefly of Grade B milk, amounted to 83, 95, and 79 qt. per store in the 1938, 1939, and 1940 surveys, respectively, while the corresponding cream sales approximated 15, 16, and 13 half pints daily. These sales were made at times when Grade B milk delivered to the doorstep was priced at 12½ and 11½ ct., while over-the-counter prices ranged from these quotations down to as low as 4 ct. a quart. Total milk purchases (store and retail route sales) per capita were greater in those areas of Manhattan and the Bronx where the proportion of milk sold through stores was greatest. Milk in paper containers, costing at least 1 ct. more a quart than that in bottles, was purchased in small amounts in low-income areas, but in high-income areas the per capita purchase of milk in the two types of containers was about the same. In low-income areas per capita purchases of fresh milk at stores were largest and of evaporated milk smallest in areas where there was least spread between the prices of fresh and evaporated milk. In general a 3-percent change in price resulted in a 1-percent change in purchases of milk by families in low-income areas, although there was no appreciable effect on purchases by families in high-income areas.

Under price and employment conditions at the time of this study it appeared that most low-income families in New York City used a minimum of about 0.4 pt. of milk per capita daily, but that their purchases increased considerably when the price fell below 10 ct. a quart. The low-income families spent about 40 percent less for milk than families in high-income areas. This difference resulted from purchase by the former group of the more economical milks (Grade B, unadvertised brands, in glass bottles, and over the counter) and by the purchase of about one-fourth less milk than was bought by the high-income families. Even including the milk equivalent of the additional evaporated milk, the milk purchases of the low-income families were about 20 percent less per capita than in the case of the families in high-income areas.

Consumer buying of potatoes and store offerings, A. S. HOTCHKISS ([*New York*] *Cornell Sta. Bul.* 764 (1941), pp. 34, figs. 10).—This report deals with one part of an investigation of consumer practices in buying potatoes as related to retail-market offerings in Cleveland, Ohio, and Rochester, N. Y., in 1936–39 (E. S. R., 85, p. 269). It presents the findings obtained (1) in visits to retail stores where 4,957 consumer purchases of potatoes were observed, and records were kept of the kind and quantity bought by each purchaser, the price paid, and the method of buying, and (2) in home interviews with 3,143 consumers observed buying potatoes who were questioned concerning the potato consumption and preferences of their families. Fifteen-lb. samples of 1,078 lots of potatoes from which the consumers purchased were shipped to New York State College of Agriculture where they were graded by the Department of Vegetable Crops and prepared, cooked, and graded for cooking quality by the College of Home Economics.

The study showed that consumers did not shop around for their potatoes, but generally bought them with little or no inspection at the same store where they bought other foods. Dissatisfaction with potatoes bought was apparently lacking even though many of the potatoes were of poor quality. Little relation was found between the retail price of the potatoes and the grade. The family income, the type or varieties of potatoes offered by a retailer, and the relative differences in the prices of the varieties offered determined the kinds of potatoes bought. Since the available supply of potatoes varied considerably, it is thought that consumers may best rely on their retailers to supply them with as good

quality of potatoes as possible at prices consumers are willing to pay. During the period covered by the study, the amount of potatoes, both Rural and Green Mountain, appearing in the retail market in branded consumer packages increased. Because of the higher price and the larger unit of sale (10 lb.), their use was limited to families with higher incomes. Consumers did not like potatoes too large or too small, but apparently did not care to have them uniformly sized. External conditions of the potato caused no great amount of dissatisfaction, since the majority of potatoes were peeled and boiled.

RURAL SOCIOLOGY

The challenge to democracy, IV, V (*Iowa Sta. Buls. P24, n. ser. (1941), pp. 669-684; P25, n. ser. (1941), pp. 685-700*).—Continuing this series (E. S. R., 86, p. 264), Paper IV, by V. A. Moody, deals with The Test of Citizenship. "Whatever the formal and technical advantages sometimes ascribed to an autocratic government, a democracy through proper action on the part of its people may achieve some measure of success in the same fields and retain its superior advantage in others. It may tend to develop a unity of will; to simplify its structure; to speed up its decisions and to fix authority more definitely. Even continuity of personnel and policy might be more largely emphasized without destroying the principles of democracy. Further, our government can be improved to the best of our ability to make it better suited to the exacting requirements of our complicated industrial civilization."

In Part V, Democracy and Nationalism, by C. H. Marterson, nationalism is explained in conjunction with democracy.

The Iowa farmer and World War II (*Iowa Sta. Bul. P31, n. ser. (1941), pp. 49-70, figs. 8*).—The reports of members of a committee appointed largely from the staff of the Iowa State College are summarized as an interpretation of the development in the war and the defense situation up to March 1941. Changes in farm population, vocational training, farm labor, nutrition and health, cost of living, housing conditions, electricity on the farm, family self-sufficiency, demand for farm products, prices, farm income and its distribution, farm costs, taxes, mechanization of farming, and changes in land use are discussed.

Population aspects of our disorganized national economy, W. H. METZLER. (Univ. Ark.). (*Southwest. Social Sci. Quart.*, 22 (1941), No. 2, pp. 150-160).—The author presented evidence of a new era of social and economic relationships in the western world.

Economic impacts of population problems, G. H. AULL. (Clemson Agr. Col.). (*Assoc. South. Agr. Workers Proc.*, 42 (1941), pp. 60-61).—The leader concludes that at present, war, disease, plague, vice, death (the "positive checks") and late marriage, sexual denial, and birth control (the "negative checks") are less effective aids to economic and social adjustment than reciprocal trade agreements, old age assistance, mothers' pensions, the ever-normal granary, steeply graduated income and inheritance taxes, land use planning, hot lunches, the WPA, the FSA, and other currently approved devices.

The past decade in southern population, M. D. OYLER and H. W. BEERS. (Univ. Ky.). (*Assoc. South. Agr. Workers Proc.*, 42 (1941), pp. 59-60).—The population of the Nation grew by only 7.2 percent between 1930 and 1940, the smallest increase ever to occur and less than half the 16.1 percent of the previous decade. The rural urban ratio is approximately the same (56.5 percent urban). Suburban areas grew nearly three times as fast as their adjacent cities and rural areas. Throughout the Nation a decline in family size was occurring, but more slowly in the Southern States than elsewhere.

Preliminary population analysis, North Dakota, 1930-1940, C. TAEUBER and R. ASHBY. (U. S. D. A.). (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 1, pp. 8-11).—"The impact of the decade 1930-40 with its physical and financial environment stimulated the movement of North Dakota people. The State as a whole lost about 6 percent of its population. Cities of from 2,500 to 10,000 and over all gained about 16 percent. The total farm population declined about 17.5 percent. These shifts in population mean that our cities will have to tax themselves to provide additional public services proportional at least to the increase in population. These shifts also mean a profound change in the distribution and density of the rural population. These shifts are continuing. The impact of defense preparations is accelerating the rate of migration of young men and women out of the State, a migration which, it is to be hoped, will be temporary in most cases. The impact of the 10-yr. trend as revealed by the census and the post-census shifts upon the supply of farm labor, upon the trend toward increased mechanization, and upon the trend to still larger operating units is obvious."

Landless farm people in the United States, M. HAREYS. (U. S. D. A.). (*Rural Sociol.*, 6 (1941), No. 2, pp. 107-116).—"Landlessness is a matter of degree. On one extreme, at the top of the agricultural ladder is the full-owner operator with an adequate size farm unit; and at the other extreme is the unemployed agricultural worker who has no permanent home. Between these two extremes are: Wage workers, migratory and resident; unpaid family workers; hired managers; sharecroppers; full tenants; part-owners; and full-owners. Farmers who have mortgages or who have small units or poor land may to such extent be considered partially landless. According to this concept, estimates are made of the extent of landlessness in the United States as of 1940."

The ecological position of the Japanese farmers in the State of Washington, J. A. RADEMAKER (Wash. Univ. [Seattle] Pubs., Theses Ser., 5 (1941), pp. 531-536).—"To a marked extent, the ecological position of the Japanese farmers in Washington has been defined by cultural conditions and restrictions upon landholding. The stress placed upon the desirability of landownership and citizenship by the cultures of the white immigrant populations was nullified with respect to the Japanese farmers by ethnocentric limitations upon naturalization. These ethnocentric limitations were made the basis of legal restrictions upon all landholding by Japanese farmers when it was seen that the latter were succeeding in their attempt to secure an advantageous ecological position in competition with whites. The constitutional prohibition against landownership by aliens who have not declared their intention to become citizens was expanded in the Anti-Alien Land Acts of 1921 and 1923 into prohibition against the holding of any sort of interest in land by such nondeclarant aliens."

The statutes governing citizenship confer that privilege and responsibility upon only those Japanese who were born in the United States and its territories. As a result, the Land Acts increased the comparative legal powers of American-born Japanese while they decreased those of the foreign-born Japanese. The net result has been a marked change in tenure of farm land by Japanese farmers. Ownership and managership of farm lands by Japanese increased greatly from 1920 to 1930, while tenancy showed a corresponding decrease.

During the pioneer period of settlement, the Japanese immigrants in Washington found their best opportunities in clearing land, building railroads, and logging, in rural areas, and in domestic and personal service in the cities. With the passing of the pioneer "laborer" stage of participation, however, the nationality type of organization tended to break down, and Japanese tried out every conceivable type of occupation.

Japanese holdings have always been highly concentrated in a few limited localities. In the Puget Sound Region they have been recorded only on alluvial

valley-bottom lands, especially of the Puyallup-White River Valley; on upland, sunny slopes of fertile soil, such as abound on Bainbridge and Vashon islands; and on muck and peat soils found in pockets along the edges of lake and Sound water and in swampy inland vales. Soil is an important factor in determining the distribution of Japanese farmers, the latter being found on only 6 of the 28 soils of the region.

White settlement in the Tropics, W. BALLY (*Internatl. Rev. Agr. [Roma]*, 22 (1941), No. 7-8, pp. 205E-246E).—From a study of numerous white settlements having very little in common, it is concluded that, contrary to general opinion, the peasant settler of the white race, whether Mediterranean or Nordic, becomes adapted to the tropical climate; he can not only live in the Tropics but also maintain his family.

The aim and scope of land-use planning, C. H. HAMILTON. (Univ. N. C.). (*Assoc. South. Agr. Workers Proc.*, 42 (1941), pp. 61-62).—The author states that the county land use planning program represents a joint effort by representative farmers in each county, community, and State, the agencies of the U. S. Department of Agriculture, the land-grant colleges, and related State and local agencies.

Some aspects of village demography, T. L. SMITH. (La. State Univ.). (*Social Forces*, 20 (1941), No. 1, pp. 15-25, figs. 3).—The author presents some of the distinguishing features of village population, including age, sex, and marital status. Some of the more important conclusions are:

"The age pattern of the village population is characterized by a slight deficiency of children, a marked deficiency of persons of early working ages, and a very large excess of aged persons. This marked concentration of aged persons in the village is probably its most important population characteristic. The village population is composed more largely of females than is the rural-farm, the rural-nonfarm, or even the urban population of the United States. This difference is more pronounced if the comparison is based on persons 21 yr. of age or over. By far the most striking feature of marital condition in the village is the concentration there, or at least in the small towns, of very large numbers of widowed and divorced females, probably from the surrounding farms."

The analysis further indicates the fallacy of considering village and rural-nonfarm as synonymous categories, and raises grave questions concerning a newer generalization which holds that "village population characteristics are intermediate between those of the city and those of the farms. Instead, the village seems to have its own distinctive population features, some of which set the village apart sharply from all other subdivisions of the population."

Methods of measuring level of living, social participation, and adjustment of Ohio farm people, H. R. COTTRAM (*Ohio State Univ., Dept. Rural Econ. and Rural Sociol. Mimeog. Bul.* 139 (1941), pp. [1]+27).—This is a methodological supplement to the above bulletin. It gives a fairly detailed statement of the methods used in analyzing the standards of living of 299 Ohio farm families, and presents simplified and standardized scales for measuring levels of living and social participation.

Income levels of contract beet workers in Nebraska, F. MILLER (*Nebraska Sta. Bul.* 335 (1941), pp. 23, figs. 3).—Income of 135 families from whom information was obtained ranged from \$693.06 to \$2,986.71 and averaged \$1,296.08. Thirteen, or 9.6 percent of the families interviewed, had incomes between \$693 and \$800, and 28 percent received incomes in excess of \$1,500.

"Growers for whom 77.8 percent of the families tended beets, provided living quarters during two or more months of the year. Of the houses provided, 56.2 percent had 3 or more rooms; 25.7 percent had 4 or 5 rooms. One-room labor

houses were occupied 48.3 percent of the year; 4- and 5-room houses were used 75 percent or more of the time. Fifty of the 135 families interviewed owned homes. The purchase price of the houses owned varied from \$75 to \$3,600 and averaged \$981.10. Thirty-eight of the owned homes were clear of debt."

Level of living, social participation, and adjustment of Ohio farm people, A. R. MANGUS and H. R. COTTAM (*Ohio Sta. Bul. 624 (1941), pp. [1]+58, figs. 3*).—Information concerning the ways of living of Ohio farm people is presented on the basis of interviews made in 299 farm homes during the winter of 1939-40. The authors found that Ohio farm people are generally well satisfied with their ways of living. They differ widely with respect to their levels of living, and those ranking high in the scale of living are much better adjusted than those ranking low. The majority of farm people participate little in organized groups, but those who do are better adjusted than those who do not.

Farmers in the farm bureau, W. A. ANDERSON ([*New York*] *Cornell Sta. Mimeog. Bul. 4 (1941), pp. [2]+41*).—The author presents some of the characteristics of about 1,200 farmers in and outside the farm bureau in Cortland and Otsego Counties, including memberships, social participation, age, farm experience, stability, schooling, family composition, educational and communication facilities, tenure and size of farm, land class, and income.

Farm women in the home bureau, W. A. ANDERSON ([*New York*] *Cornell Sta. Mimeog. Bul. 3 (1941), pp. [1]+41*).—This study of about 800 families in Cortland County indicates the extent to which farm women participate in the home bureau in New York State, and compares them with farm women who do not so participate in order to discover the distinguishing characteristics of the two groups.

The community situation as it affects agricultural extension work, C. R. HOFFER and D. L. GIBSON (*Michigan Sta. Spec. Bul. 312 (1941), pp. 35, figs. 6*).—"It is plainly evident from the analysis and comparison of the four communities [studied] that no single factor or circumstance in a community situation determines the responsiveness of farmers to agricultural extension programs. Responsiveness is determined rather by a network of social influences and circumstances among which leadership, organization, and group morale among farmers are very important. These are affected, in turn, by economic conditions and community organization. To consider any single item as the sole cause of success or failure of extension work over-simplifies the problem."

Rural relief in Illinois: A study of home assistance in thirteen counties, D. E. LINDSTROM and I. D. JOHNS (*Illinois Sta. Bul. 480 (1941), pp. 393-440, figs. 8*).—From a study of conditions in 13 counties from January 1934 through June 1937, the conclusion was reached that "much of the public aid fell short of being effective enough to put the dependent back on the road to self-support or to provide adequate living standards for those unable to work. . . . Rural families on relief are at a disadvantage because they have had fewer years of schooling and have a greater incidence of ill health than either urban relief families or rural families not on relief. Most of the rural relief clients are unskilled laborers in small towns and villages or farm hands or tenants on poor land. . . . Administration of relief in rural areas must be so co-ordinated as to prevent unnecessary duplication, assure the efficiency required to help employable dependents become self-supporting, and provide all unemployables on relief with a decent standard of living."

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Motion pictures of the United States Department of Agriculture, 1941 (*U. S. Dept. Agr., Misc. Pub. 451 (1941), pp. [2]+29*).—The motion pictures

available are listed and described. How they are distributed and may be purchased are explained. The State institutions lending the pictures are listed.

FOODS—HUMAN NUTRITION

Annual review of biochemistry, X, edited by J. M. LUCK and J. H. C. SMITH (*Stanford University, Calif.: Ann. Rev., Inc., 1941, vol. 10, pp. XI+692*).—Among the 24 reviews comprising this volume, the following deal with topics of nutritional significance: Biological Oxidations and Reductions, by E. S. G. Barron (pp. 1-30); Proteolytic Enzymes, by M. Bergmann and J. S. Fruton (pp. 31-46); Nonproteolytic Enzymes, by H. Tauber (pp. 47-64); The Chemistry and Metabolism of the Compounds of Sulfur, by A. White (pp. 125-150); Carbohydrate Metabolism, by C. F. and G. T. Cori (pp. 151-180); Fat Metabolism, by H. C. Eckstein (pp. 181-196); The Metabolism of Proteins and Amino Acids, by R. Schoenheimer and S. Ratner (pp. 197-220); The Biochemistry of Creatine and Creatinine, by H. H. Beard (pp. 245-264) (La. State Univ.); Detoxication Mechanisms, by J. A. Stekol (pp. 265-284); Hormones, by E. C. Kendall (pp. 285-336); The Water-Soluble Vitamins, by A. F. Morgan (pp. 337-394) (Univ. Calif.); Fat-Soluble Vitamins, by H. A. Mattill (pp. 395-422); and Nutrition, by H. K. Stiebeling and R. M. Leverton (pp. 423-448) (U. S. D. A.).

An inexpensive portable photoelectric colorimeter, R. H. MORGAN and S. WEINHOUSE (*Amer. Jour. Clin. Pathol., 10 (1940), No. 9, Tech. Sup., pp. 114-122, figs. 5*).—The colorimeter described utilizes a photoelectric cell or phototube as the optoelectric device. Its current response to incident light, projected from a small flashlight bulb through the solution whose concentration is to be measured and passed through a selective filter, is small. The cell is used, however, with a vacuum tube amplifier which greatly increases the response so that relatively insensitive and inexpensive current measuring equipment (a milliammeter) may be used. Complete details for construction, operation, and calibration of the instrument are given. A brief bibliography includes references to several treatises that discuss the theory of photoelectric colorimetry and of photoelectric colorimeter design.

Improvements in the photometer and its accessories, A. S. GIORDANO, M. N. STATES, and C. SHEARD (*Amer. Jour. Clin. Pathol., 10 (1940), No. 9, Tech. Sup., pp. 122-129, figs. 6*).—Recent modifications in the instrument and various accessories now available are noted. These include a microattachment with a new photocell having greater current response than older types of cells for a given intensity of light; microabsorption cells of several types; a fixed diaphragm for use with the microattachment to confine the beam of light to a cross section substantially rectangular in shape; and a microadjuster devised for accurate setting of the needle of the meter at the standard 100 division point.

The wheat kernel and its nutritional properties, C. H. BAILEY. (Minn. Expt. Sta.). (*Amer. Miller, 69 (1941), No. 1, pp. 93-94, 187-188, 160, figs. 3*).—This address is concerned with the dietary contribution in protein, minerals, and vitamins of the various parts of the wheat kernel—pericarp, germ, and endosperm—and the relationship between the percentage of flour extraction and the content of these dietary factors in the flour. This composition of wheat and flour is considered in the light of the present "enrichment" program.

Trace metals and total nutrients in human and cattle foods, E. B. HOLLAND and W. S. RITCHIE (*Massachusetts Sta. Bul. 379 (1941), pp. 31*).—Moisture, protein, fat, nitrogen-free extract, fiber, ash (soluble and insoluble), and Fe, Cu, Mn, Zn, Ca, and P were determined by methods noted on a large number of products designated by common and botanical names. Analytical methods

for the mineral determinations are given in detail. The products included 17 fruits classified as major or large fruits (10) and minor fruits and berries (7); 36 vegetables, including 8 garden fruits (tomatoes, eggplant, etc.), 5 legumes (string beans, peas, and shell beans), and 23 leafy and stem vegetables; 12 cereals; 4 nuts; 8 processed human foods (chiefly cereal products); 25 cattle feeds, including 11 hays and grasses and 14 feeds used as protein sources; 10 samples classified as kitchen wastes (chiefly skins and tops); and 8 miscellaneous products. Data are reported for more than 1 sample of many of the products, with brief descriptive notations indicating varietal, cultural, or other differences between samples.

Conserving minerals and vitamins in vegetables, O. SHEETS (*Mississippi Sta. Bul.* 362 (1941), pp. 15, figs. 4; also in *Miss. Farm Res.* [*Mississippi Sta.*], 4 (1941), No. 9, pp. 3-5, 8, figs. 4).—This study, concerned with the losses of minerals and vitamins occurring with different methods of preparing, cooking, and preserving vegetables, summarizes findings from various studies, including several noted earlier from this station (*E. S. R.*, 82, pp. 415, 846; 85, p. 556).

The home canning of fishery products, N. D. JARVIS and J. F. PUNCOCHAR (*U. S. Dept. Int., Bur. Fisheries, Invest. Rpt.*, 2 (1940), No. 34, rev., pp. II+36, figs. 6).—This revision of a publication noted earlier (*E. S. R.*, 77, p. 563) considers the general principles involved in canning sea foods, the equipment needed, and the general canning procedure, and presents simple, practical, and safe methods now developed for canning the most important varieties of fish suitable for canning, as well as a number of fishery products.

Community food preservation centers, B. FURMAN ET AL. (*U. S. Dept. Agr., Misc. Pub.* 472 (1941), pp. III+64, figs. 5).—This handbook, combining research results with practical experience, is offered as a contribution to community food preservation programs for defense. Based on subject matter furnished by the Bureau of Home Economics, the Extension Service (Federal and State), the Farm Security Administration, and the Works Projects Administration, the publication represents a revision and an enlargement of an earlier booklet on community canning centers (*E. S. R.*, 70, p. 892).

Making the nutrition program work, C. M. LADD. (Cornell Univ.). (*Family Dollar*, 2 (1941), No. 7, pp. 12-15, figs. 3).—An address delivered at the New York State Nutrition Conference, July 1941.

Nutritional studies of foodstuffs used in the Puerto Rican dietary.—VII, A comparative study of the nutritive value of three diets of frequent use in Puerto Rico, D. H. COOK, J. H. AXTMAYER, and L. M. DALMAU (*Puerto Rico Jour. Pub. Health and Trop. Med.*, 16 (1940), No. 1, Eng. text, pp. 3-13; Span. text, pp. 14-25).—Three typical diets were selected for study, these being (1) the continental diet as used by natives of the United States long resident in Puerto Rico, (2) the caterer diet as used by a large group of families who buy their food already prepared from caterers, and (3) the country family diet representative of that consumed by the poorest country families. Diets of this latter type were prepared in the laboratory from food lists obtained in a study by the insular department of education as to the kinds and weights of foods consumed by a family for a week. Aliquot weights or volumes of these various dishes and foods prepared in the laboratory and of continental and caterer diets as prepared for family consumption were composited daily for each of the three diets over periods of several weeks. These diets were analyzed for proximate constituents and calcium, phosphorus, and iron, using A. O. A. C. methods, and assayed for vitamin A, using the method of Sherman and Munsell. The results, reported as percentage values (and as units of vitamin A per gram) are also calculated to a uniform daily basis of grams (and units) per 2,400 calorie portions.

On the latter basis, the average daily consumption of nutrients in the continental, caterer, and country family diets, respectively, is as follows: Protein 55, 86, and 59 gm.; fat 99, 76, and 62; carbohydrates 321, 340, and 400; calcium 0.352, 0.277, and 0.291; phosphorus 1.29, 1.49, and 0.734; iron 0.021, 0.028, and 0.032 gm.; and vitamin A 7,895, 2,419, and 1,220 Sherman units. These data, considered from the standpoint of nutritional standards of adequacy, indicate that the protein content was quantitatively adequate in all dietaries, but of poor quality in the two native diets. Calcium was low in all dietaries, and vitamin A did not meet the level for adequacy in either of the native diets. A high proportion of rice and beans, lack of milk and dairy products, and a small quantity of vegetables characterized the native diets.

The nutritive value of the proteins of rice and its by-products.—III, Amino acid content, M. C. KIRK. (Ark. Expt. Sta.). (*Cereal Chem.*, 18 (1941), No. 3, pp. 349-354).—In continuation of this study (E. S. R., 84, p. 550), whole rice, polished rice, rice bran, and rice polishings were analyzed, by methods noted briefly, for their content of cystine, tryptophan, lysine, arginine, and histidine. Whole rice and polished rice were not lacking in cystine or lysine, but the levels were low as compared to casein and wheat. The results confirmed earlier findings as to the supplementary effect of cystine and of lysine in promoting rat growth on rations in which protein was furnished by whole or polished rice. Tryptophan, arginine, and histidine contents compared favorably with the amounts of these amino acids in wheat and corn. Rice bran and rice polishings were appreciably richer in the several amino acids than were the whole and polished grain. The six varieties of rice analyzed were found to differ in the proportions of the several amino acids they contained. "Increases were obtained in cystine, tryptophan, lysine, arginine, and histidine content of the proteins of rice from plats treated with fertilizers (superphosphate, ammonium sulfate, Ammophoska, NaNO_3 , and sulfur) as compared to the amino acid content of the proteins of rice from untreated plats."

Nitrogen metabolism in hyperthyroidism, B. SURE, Z. W. FORD, JR., R. M. THEIS, and M. GOLDFISCHER. (Ark. Expt. Sta.). (*Endocrinology*, 28 (1941), No. 5, pp. 806-815).—This paper reports a study of the influence of hyperthyroidism in rats on the distribution of the nonprotein nitrogen of the blood, as determined by microchemical methods with the Evelyn photoelectric colorimeter, and on the partition of nitrogen in urine as determined by standard methods with slight modifications which are noted. The influence of glycine on creatine-creatinine metabolism in hyperthyroidism was also determined in a small group of rats. The data obtained are tabulated for individual rats and summarized as follows:

"Subcutaneous daily injections of synthetic (*d*-1) thyroxine produce a disturbance in nitrogenous metabolism, as evidenced not only by an increased total nitrogen output in the urine and a marked creatinuria and reduction of preformed creatinine, but also by pronounced increases in ammonia and uric acid excretion and by an appreciable reduction in the excretion of allantoin. Thyroxinized animals show a marked retention of blood uric acid. The marked reduction of muscle and heart creatine in hyperthyroidism cannot be prevented by massive doses of vitamin A or ascorbic acid. Subcutaneous injections of glycine are followed by small increases in urinary excretion of preformed creatinine and in significant increases in excretion of creatine, but glycine will not prevent the great losses of creatine from the muscles and the myocardium."

Nutrition in relation to eye function, H. S. MITCHELL. (Mass. State Col.). (*Jour. Amer. Dietet. Assoc.*, 17 (1941), No. 2, pp. 95-101).—This is a general discussion of the relation to eye function of deficiencies in vitamins (A, riboflavin,

and ascorbic acid) and of metabolism of minerals (calcium and sodium), carbohydrates (glucose, xylose, and galactose), and nitrogen. The information presented is summarized in a table, giving for each of the nutrients discussed the name or description of the eye condition associated with its deficiency or disturbed metabolism and the response to treatment with specific substances or clinical implications. A list of literature references is appended.

Middle and old age in cholesterol-fed rats, R. OKEY. (Calif. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 3, pp. 466-470).—In rats fed diets containing 1 percent of cholesterol from weaning throughout the life span, growth, health, and time of survival did not differ significantly from controls on the same diet without cholesterol. Histological examination of the grossly enlarged and fatty livers resulting from the high cholesterol feeding showed fatty infiltration rather than degeneration of functioning tissues. In animals developing infections or becoming ill from other causes there was a much more rapid disappearance of ester cholesterol from the liver than in animals transferred from a cholesterol-rich to a cholesterol-poor diet.

Effects of simple dietary alterations upon retention of positive and negative minerals by children, I. G. MACY, F. C. HUMMEL, H. A. HUNSCHER, M. L. SHEPHERD, H. J. SOUDERS, ET AL. (*Jour. Nutr.*, 19 (1940), No. 5, pp. 461-476).—In metabolism studies with nine children from 5 to 8 yr. of age, the preexperimental and experimental periods ranged from 20 to 55 consecutive days for each child. The dietary alterations in the experimental period consisted, in the first group, of the addition of 100 gm. of banana to the daily diet; in a second and a third group, which differed in the proportion of apple in the basal diet, 100 gm. of banana were substituted for 10 gm. of white bread and 20 gm. of cereal; and in a fourth group 100 gm. of banana, 30 gm. of potato, 10 gm. of butter, and 50 gm. of white bread were added to the basal diet during the experimental period. By this manipulation of the proportions of banana, apple, and cereal in adequate mixed diets, the intakes of positive and negative minerals were maintained at approximately constant levels for each subject, but the component inorganic elements within the positive (Ca, Mg, Na, and K) and negative (P, S, and Cl) mineral groups were altered. There were only slight alterations in the nitrogen intakes.

The balance data, discussed in some detail, indicate that 100 gm. of banana were more effective than the same amount of apple or 30 gm. of cereal in stimulating the rate of growth. This growth performance was accomplished in spite of the fact that the same intake (per kilogram) of total, positive, and negative minerals was maintained during the high and low banana periods. These results are considered to verify Shohl's thesis (*E. S. R.*, 83, p. 845) that "individual elements, or rather, certain groups of elements, perform separate functions in the body economy, and are therefore more important than the total."

The utilization of the calcium of milk by adults, H. BREITER, R. MILLS, J. DWIGHT, B. McKEY, W. ARMSTRONG, and J. OUTHOUSE. (*Univ. Ill.*). (*Jour. Nutr.*, 21 (1941), No. 4, pp. 351-362).—Calcium metabolism studies designed to determine the utilization of the calcium of milk were conducted on seven healthy adults—four women and three men, ranging in age from 21 to 42 yr. The general plan of the experiment was similar to that of earlier studies on children by Outhouse et al. (*E. S. R.* 82, p. 132) and Kinsman et al. (*E. S. R.*, 82, p. 133), with modifications to meet adult dietary needs and to utilize 5-day metabolic periods. Calcium was fed at two different levels, the lower level, supplied by the basal dietary which was fed for a period of 34 days, furnishing on an average 270 mg. a day. The higher level, received over an additional 24-34 days, was obtained by supplementing this basal dietary with enough pasteurized fluid milk to produce a slightly negative balance. The quantity of milk received by

each subject daily was determined by the magnitude of his calcium losses during the basal period, and ranged from 180 to 500 gm. During the basal period the seven subjects on respective daily total calcium intakes of 248, 264, 278, 274, 231, 309, and 259 mg. were in negative balance to the extent of 67, 88, 80, 67, 120, 65, and 141 mg. During the milk period the daily calcium intakes (of the subjects in the same order) were 451, 568, 574, 580, 498, 603, and 873 mg., with resulting balances of -36, +5, +24, -13, -39, -5, and -22 mg. By relating differences in calcium intakes to the differences in corresponding calcium losses, according to the formula used in the earlier study by Kinsman et al., the following values for the utilization of milk calcium were obtained: 15.3, 30.6, 35.1, 17.6, 30.3, 20.1, and 20.4 percent. Nothing in the data offered explanation for the division of the subjects into high and low utilizers.

The calcium requirement of man: Balance studies on seven adults, J. OUTHOUSE, H. BREITER, E. RUTHERFORD, J. DWIGHT, R. MILLS, and W. ARMSTRONG. (Univ. Ill.). (*Jour. Nutr.*, 21 (1941), No. 6, pp. 565-575).—Data from the calcium metabolism studies reported above were used for computation of the calcium requirements of the seven adults whose utilization of milk calcium had been studied. The calcium requirement was computed as $\text{calcium intake} \pm [\text{calcium balance} \times (100 \div \% \text{ utilization of milk calcium})]$, the + sign being used for the subjects who were in negative balance and the - sign for those in positive balance. It is pointed out that the data used were secured at levels of intake almost sufficient to induce calcium equilibrium, and that the computation took into account the individual's capacity for utilizing food calcium, as determined in the case of milk. The total respective requirements thus calculated amounted to 686, 552, 506, 654, 627, 625, and 951 mg. of calcium daily for the seven subjects in the order noted in the above study. The average (662 mg. daily), when based on weight, height, and surface area, amounted to 10.7 mg. per kilogram, 3.9 mg. per centimeter, and 391 mg. per square meter. These requirements, calculated on a 70-kg. weight basis, averaged 752 mg., which is 67 percent greater than Sherman's 450-mg. requirement. The latter figure is considered too low, however, because it was predicated on the assumption that adults utilize 100 percent of their dietary calcium.

Further experiments on the calcium requirement of adult man and the utilization of the calcium in milk, F. R. STEGEMAN and H. H. MITCHELL. (Univ. Ill.). (*Jour. Nutr.*, 21 (1941), No. 6, pp. 577-588).—In continuation of a study reported earlier (*E. S. R.*, 81, p. 739), 25 calcium balance periods extending over 12-32 days each were carried out on nine adult men. All subjects showed negative balances in the preliminary periods in which they received basal diets furnishing on an average 203 mg. of calcium daily. In subsequent periods the basal diet was supplemented with milk products (liquid whole milk, liquid skim milk, "dry milk solids," and homogenized milk) in amounts to provide enough calcium for approximate equilibrium. Comparisons of the balance data secured in basal and test periods gave indication of the amount of the supplemental calcium utilized. The utilization, calculated as percentage of the total calcium in the milk supplement, averaged 29 percent, although the individual averages, in increasing order, were 18, 19, 21, 21, 25, 29, 32, 36, and 49 percent. There was no evidence that calcium from the various milk products was utilized with different degrees of efficiency. In particular, the commercial desiccation of milk or its homogenization did not appreciably impair biological utilization of its calcium.

The calcium requirement for equilibrium, calculated essentially as noted above in the study by Outhouse et al., averaged 9.55 ± 0.46 mg. daily per kilogram of body weight, or 357 ± 15 mg. per square meter of body surface. This require-

ment related to diets in which about two-thirds of the calcium content was furnished by milk products. It is pointed out that this value agrees well with the estimate of I. Leitch⁴ of 10.0 mg. per kilogram of body weight for women and with the estimate of Mitchell and Curzon⁵ of 9.75 mg. per kilogram of body weight, but that it is 50 percent higher than Sherman's estimate (E. S. R., 44, p. 563) of 0.45 gm. per 70 kg. of body weight. The latter estimate is considered too low, since it was derived without consideration of the close positive correlation between intake and excretion of calcium.

"The dangers attending the use of any average calcium requirement of maintenance in assessing the prevalence in a community or population of calcium undernutrition are discussed."

The effect of calcium and phosphorus on the metabolism of lead, J. B. SHIELDS and H. H. MITCHELL. (Univ. Ill.). (*Jour. Nutr.*, 21 (1941), No. 6, pp. 541-552).—The retention of lead as affected by variation in the content of calcium and phosphorus in the diet was investigated in a series of experiments involving 128 growing or adult rats fed diets containing low concentrations of lead (16-32 p. p. m.). While the concentration of dietary lead was held constant in any given experiment, the concentration of calcium or phosphorus, or both, was varied in the series of diets. Food intakes of rats on comparable diets were equalized, the amounts of food consumed per rat being generally 500, 600, or 1,000 gm. This permitted the interpretation of results in terms of the relative compositions of the diets. The retentions of lead, and of calcium and phosphorus also in some experiments, were measured by carcass analysis.

The results are interpreted as indicating that a low content of calcium or phosphorus, or of both, in the diet induced a high retention of lead in comparison with diets with higher mineral levels. Lead storage on the diet with a moderate amount of lead (32 p. p. m.) occurred in adult rats only when the calcium content was lowered to inadequate or borderline levels (0.03-0.12 percent). With moderate levels of dietary lead, excessive levels of dietary calcium and phosphorus did not offer special protection against assimilation of lead by the body. Under the imposed conditions of variable dietary calcium and phosphorus levels, the retention of calcium varied in a way diametrically opposed to that of lead. "Under conditions of practical nutrition, an adequate intake of calcium and of phosphorus presumably protects the body against appreciable assimilation of the low levels of dietary lead involved in the usual lead hazard of modern life. This protection is more effective in the adult than in the adolescent for any given concentration of calcium and phosphorus, possibly because the mineral metabolism of the bone trabeculae is considerably less intense in the adult than in the growing organisms."

Fasting catabolism and food utilization of magnesium deficient rats, M. KLEIBER, M. D. D. BOELTER, and D. M. GREENBERG. (Univ. Calif.). (*Jour. Nutr.*, 21 (1941), No. 4, pp. 363-372, fig. 1).—In this study, parallel to one reported earlier on calcium deficiency (E. S. R., 85, p. 417), 10 rats were placed on a magnesium-deficient diet when 36 days old, allowed unlimited food intake for 5 days, then paired according to weight and fasting catabolism, and one animal continued on the magnesium-deficient diet (2.06 mg. Mg per 100 gm. food) ad libitum, while the pair mate was fed the magnesium-supplied control diet (84 mg. Mg per 100 gm.) in restricted amounts (83 percent of that consumed by the deficient rat) to keep weight gain essentially equal to that of the deficient animal. Fasting catabolism was measured twice in the 5-day preliminary period

⁴Nutr. Abs. and Rev., 6 (1937), No. 3, pp. 553-578, figs. 4.

⁵The dietary requirement of calcium and its significance, H. H. Mitchell, with collab. of E. G. Curzon. Paris: Hermann & Co., 1939, pp. 103, fig. 1.

and three times during the main part of the experiment, which was terminated when the rats were 98 days old.

The rats on the deficient diet gradually lost appetite and after 60 days on the regime ceased to grow. Magnesium-deficient and control rats were similar as to water, ash, fat, and protein content, but the carcasses of the deficient animals contained only half as much magnesium as the control rats. Body length was essentially the same in the two groups of rats, but dry weights of heart and liver were greater and those of thyroid and adrenal glands significantly greater in the magnesium-deficient rats than in the controls supplied with magnesium. The fasting catabolic rate of the deficient rats amounted to 125 percent of the rate of the controls 57 days after the pairing of the rats. Analysis of weight gains with respect to food intake indicated that energy and protein were less efficiently utilized by the magnesium-deficient rats, the extra waste, in comparison with the control group, amounting to about 18 percent of the intake. The increased rate of fasting catabolism was not sufficient to explain the extra waste of energy. It is concluded, therefore, that the magnesium deficiency caused an increased loss of unoxidized material in the excreta, or increased the calorogenic action of the food.

Iron metabolism in human subjects on daily intakes of less than 5 milligrams, R. M. LEVETON. (Nebr. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 6, pp. 617-631, figs. 2).—Iron metabolism studies were conducted on four healthy college girls for periods of from 3 to 8 mo. The basal diet was adequate in all known dietary essentials except that it furnished only 3.5-4.5 mg. of iron daily. Food iron intake, and iron losses through (1) urinary excretion, found to be low and constant for each subject, (2) fecal excretion, and (3) loss in the menses were determined by analyses of aliquots of composite samples of the respective materials. Dietary management and sample analysis, discussed in some detail, were conducted with great care to preclude iron contamination. Serum iron values were followed in order to study the relation of level of intake and excretion to endogenous iron metabolism, and certain blood determinations were made periodically.

Fecal excretions did not exceed the iron intake, thus indicating that the intestine normally does not excrete iron. At all times on the low-iron diet the total of fecal, urinary, and menstrual iron losses exceeded the intake, so that the body was losing iron from storage depots. On a daily iron intake of 3.50 mg. the body loss of iron averaged 0.33 mg. daily. When the 750 cc. of milk of the basal diet of three subjects was replaced by 116 gm. of lean beef, which furnished an equivalent amount of protein, the iron content of the diet was thereby increased to 6.55 mg., and the iron balance changed from negative to positive, with an average daily retention of 2.14 mg. of iron. Hemoglobin, cell volume, and red blood cell, white blood cell, and differential counts remained throughout the study within the limits of normal variations, and reflected, therefore, no measurable effects of either the low-iron diet or its supplements. Serum iron, however, decreased consistently and significantly on the low-iron regimen, but whenever the iron intake was increased, by substitution of beef for milk in the basal diet or by shift to freely chosen diets, the serum iron levels rose markedly, only to drop again when the low-iron intake was resumed. These results suggested the possibility of conducting iron metabolism studies by determining serum iron values during different levels of iron intake. Although the study did not definitely establish the adequacy of 6.5 mg. of iron daily for young women in general, it is suggested that there is no need for emphasis on amounts exceeding that figure; rather emphasis should be placed on liberal amounts of other dietary essentials.

Correlation of histological differentiation with beginning of function of developing thyroid gland of frog, A. GOEBMAN and H. M. EVANS. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 47 (1941), No. 1, pp. 103-106, fig. 1).—The stage of differentiation at which thyroid gland first exhibited the ability for storage of iodine was studied in an experiment using tadpoles of the frog, *Hyla regilla*, placed in water to which radio-iodine was added as the sodium salt. The accumulation of radio-iodine in thyroid tissue was revealed by placing sections of tissue in contact with X-ray films. The findings indicated that in this frog function of the thyroid began very early after formation of follicles within each of the two primitive, still yolk-laden lobes. It is pointed out that the iodine in the serial sections which produced the radio-autographs had remained in the thin section even after immersion in aqueous and alcoholic solutions, in alcohol-ether, and xylene, and that the iodine was, therefore, very likely in an organic linkage, probably as thyroglobulin.

Nutritional factors concerned in rusting of albino rats, H. S. OWENS, M. TRAUTMAN, and E. WOODS. (Univ. Idaho). (*Science*, 93 (1941), No. 2417, pp. 406-407).—It is noted briefly that rusting of the fur of albino rats has been produced in the absence of choline or pantothenic acid and has been prevented by supplementing the diet, presumably adequate in the other vitamins of the B complex, with at least 40 μ g. of pantothenic acid and 20 μ g. of choline. The minimum quantity of the latter necessary to prevent rusting was not determined. "The implication is that no matter what the factors are that prevent development of rustiness in albino rats, the liver must play an important role in their metabolism."

The choline content of rats on various choline-free diets, H. P. JACOB, C. A. BAUMANN and W. J. MEEK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 138 (1941), No. 2, pp. 571-582, fig. 1).—When 26 rats weighing from 38 to 55 gm. were taken from the stock diet and fed on various experimental diets until they had increased their weight at least threefold, this was found to require from 3.7 to 17.6 weeks on the various diets. At the beginning of the experiment the choline content of the animals ranged from 38 to 51 mg., averaging 43 mg. After from 8 to 18 weeks on the choline-free diet, the animals contained from 118 to 209 mg. (average 151 mg.) of choline, as much as 76 mg. having been synthesized in 8 weeks by one animal. Animals raised on the stock diet contained about the same amount of choline as rats of similar weight on the choline-free diet. Choline synthesis was reduced somewhat on a diet high in fat, but other variations in the low-choline diet, such as high protein, high cystine, and a change of protein, as well as the addition of choline, had little or no effect on the choline content of the tissues. The increase in any one tissue or in the entire animal paralleled the increase in weight recovery, roughly from 0.8 to 0.9 mg. of choline being present per gram of rat whether choline was supplied in the diet or not.

The method described for the determination of choline involved extraction of the sample with an alcohol-ether mixture and hydrolysis of the concentrated extract with barium hydroxide, followed by neutralization with acetic acid and removal of insoluble material by filtration. Choline was precipitated from the filtrate with ammonium reineckate in methanol. Choline reineckate, separated from other reineckates by virtue of its insolubility in water and ethyl alcohol, was dissolved in acetone, in which it gave a red solution, and was determined colorimetrically in an Evelyn photoelectric colorimeter. The results agreed satisfactorily with those determined by a highly specific biological method (described in detail) involving the contraction of the rectus abdominis muscle of the frog in the presence of acetylcholine and eserine.

Improved diets for nutritional and pathologic studies of choline deficiency in young rats, R. W. ENGEL and W. D. SALMON. (Ala. Polytech. Inst.).

(*Jour. Nutr.*, 22 (1941), No. 2, pp. 109-121, pls. 2).—Of seven diets on which choline deficiency was produced in rats, the most successful with respect to growth, as well as production of choline deficiency symptoms, consisted of alcohol-extracted peanut meal 30, extracted casein 6, sucrose 54, salt mixture 4, and lard 6 percent, with daily supplements of 20 μ g. each of thiamin chloride, pyridoxin, and riboflavin, and factor 2 concentrate equivalent to 1 gm. of liver, and weekly supplements of vitamins A and D as β -carotene and calciferol. On this diet severe symptoms were produced in all of the animals in from 6 to 10 days, while controls receiving 20 mg. of choline chloride daily remained normal and gained about 3 gm. daily. Cystine added to this diet failed to stimulate growth.

The symptoms and signs of the deficiency condition are described as drowsiness and inactivity, palpably enlarged kidneys, and abdominal distention, usually with death resulting within 48 hr. after the appearance of the first symptom and preceded by several minutes of extremely labored breathing, tremors, coma, loss of normal skin color, and lowered temperatures. Less common symptoms were diarrhea and eye hemorrhage originating in the ciliary vessels and spreading into the posterior chamber. Uremia was indicated by high nonprotein nitrogen in the blood and positive xanthidrol reaction. On autopsy the kidneys, which averaged 100 percent more in weight than those of the positive controls, were greatly enlarged, firm, bright red in color, and hemorrhagic, with thickened capsule; the livers pale and fatty; and the thymus atrophied. Hemorrhagic foci were frequently present in the heart, muscle, adrenal cortex, and lungs, and in many animals the lumbar and sacral lymph nodes were filled with blood. The spleen varied in appearance from swollen and bright red to shrunken and pale. Rats surviving the acute attack resumed growth and lived for several weeks to several months, but showed on autopsy pitting and scarring of the kidney surface. Animals suffering less severely were able to make an apparently complete recovery.

"The data presented here are of importance in relation to nutritional investigations where purified diets are employed. Subacute cases of choline deficiency could easily be overlooked, since such animals appear quite normal and palpably enlarged kidneys is the only reliable symptom. Routine choline supplements to purified diets for the rat would appear essential on the basis of the present findings."

How to control vitamin content (*Food Indus.*, 13 (1941), No. 6, pp. 35-66, figs. 35).—This symposium of experience and judgment by those who deal with vitamins in foods on an industrial scale is presented to show the complexity and cost of such control, to review industrial practices, and to present facts in proper balance. Quality control is defined as the problem of producing a uniform product rather than getting as much vitamin as possible into the product. Prevention of vitamin losses, and problems pertaining to materials, technology, equipment, plant operation, control, patents, and management are cited as problems involved in vitamin content control. Most foods are considered as worthy of consideration for improvement either by improved processing methods to conserve the original vitamin content or by enrichment with added vitamins. The following papers are presented: How to Add and Control Vitamin A in Margarine, by H. W. Vahlteich; How to Add Vitamin D Concentrate and Control Vitamin D in Milk, by C. I. Post; Irradiation and Control of Vitamin D in Milk, by K. C. Weckel (Univ. Wis.); How to Get Vitamin D into Milk by Feeding Cows Yeast, by C. N. Frey; Irradiation and Control of Vitamin D in Cereals, by F. L. Gunderson; How to Conserve Vitamin C in a Liquid, by P. F. Sharp, D. B. Hand, and E. S. Guthrie (Cornell Univ.); How to Add B Vitamins and Control Content in Flour, by C. H. Bailey (Univ. Minn.); How B. A. Eckhart Milling Co. Makes Enriched Flour, by W. G. Epstein; Addition and Control

of Vitamin B₁ in Cereals, by F. N. Peters; Vitamin Control for Baking Industry, by R. T. Bohn; How to Sample Bread for Vitamin Assay, by L. W. Haas; How to Sample Flour for Vitamin Assay, by W. L. Heald; Role of Independent Laboratory in Product Control, by B. L. Oser; Quick Review of Chemical Methods for Determining Vitamins, by A. W. Thomas; Use of Yeast in Vitamin Control, by L. Atkin, A. S. Schultz, and C. N. Frey; and Control of Nicotinic Acid in Flour and Bread, by B. L. Oser, D. Melnick, and L. Siegel.

The number of vitamins required by the rat, L. R. RICHARDSON, A. G. HOGAN, B. LONG, and K. I. ITSCHNER. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 46 (1941), No. 4, pp. 530-532, fig. 1).—A diet described previously (E. S. R., 84, p. 851) as promoting a moderate rate of growth with only purified sources of the B vitamins (thiamin, riboflavin, vitamin B₆, and calcium pantothenate) has been further improved by increasing the quantities of these vitamins and adding choline. Ration C, embodying these changes, consists of casein 20, sucrose 65, lard 8, salt mixture 4, and cellulose 3 parts, supplemented by a concentrate of vitamins A and D in amounts of 3 mg. per rat daily, and for every 100 gm. of the ration α -tocopherol 2.5, thiamin 0.8, riboflavin 1.6, vitamin B₆ 1.2, calcium pantothenate 1.0, and choline 400 mg.

"At present it seems that the eight vitamins included with ration C are all that the rat requires to attain normal weight maturity, though it is possible that the basal ration may conceal some unsuspected vitamin. However that may be, in any search for unrecognized vitamins an examination of the quantitative interrelations of the recognized vitamins is of crucial importance."

The effect of certain carcinogens on vitamin A in the liver, C. A. BAUMANN, E. G. FOSTER, and P. S. LAVIK. (Wis. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 5, pp. 431-444).—Rats were injected with carcinogenic and similar non-carcinogenic compounds, and the storage of vitamin A in their livers was compared with that of nontreated animals fed the same amount of vitamin A.

Dibenzanthracene, an active carcinogenic agent, injected intraperitoneally in colloidal form increased the rate of depletion of liver stores of vitamin A and interfered with the entrance of the vitamin into the liver. A similar increase in vitamin A depletion followed the subcutaneous injection of dibenzanthracene in oil. Methyl cholanthrene, a more potent carcinogenic substance, also reduced liver stores of vitamin A but to a less rather than a greater extent than dibenzanthracene. Benzpyrene, another potent carcinogen, and 1,2-benzanthracene, a noncarcinogenic hydrocarbon, also reduced liver stores to a less degree than dibenzanthracene. Butter yellow, which is carcinogenic, and carbon black, which is noncarcinogenic, had no effect on vitamin A storage. The livers of rats with spontaneous tumors contained more vitamin A than the livers of nontumorous controls, but the livers with tumors due to methyl cholanthrene contained more vitamin A than those of nontumorous rats treated with dibenzanthracene.

It is concluded that there is no correlation between the carcinogenicity of the compound and its effect on vitamin A, and that decreased vitamin A is not a necessary prerequisite to tumor formation.

The effect of certain fats and unsaturated fatty acids upon the utilization of carotene, W. C. SHEERMAN. (Ala. Expt. Sta.). (*Jour. Nutr.*, 22 (1941), No. 2, pp. 153-165, figs. 2).—Young rats were depleted of their vitamin A stores essentially as described previously (E. S. R., 84, p. 731) and then tested for their growth response to highly purified coconut, wheat-germ, cottonseed, linseed, and soybean oils in doses of 0.5 cc. daily and to carotene in amounts of 1 or 2 μ g. daily alone and with 0.1 cc. of decolorized butterfat or one of the above oils. In the absence of carotene all of the animals lost weight and died within 5 weeks, showing severe ophthalmia. Growth on carotene alone was exceeded only slightly

by growth on carotene supplemented with coconut oil and butterfat, but was definitely increased by wheat-germ oil, corn oil, linseed oil, and cottonseed oil. A still greater increase was obtained with soybean oil at both levels of carotene intake.

As the most obvious difference between the oils which did and did not promote growth was in their content of essential unsaturated fatty acids and there was some evidence in dry scalliness of the skin of a deficiency of unsaturated fatty acids, methyl linolate and methyl linolenate, esters of unsaturated fatty acids, were tested in a similar manner to the oils. With low levels of carotene both of the esters showed an antagonistic effect, growth being less than on carotene alone. In the presence of soybean oil the antagonistic effect of methyl linolate was overcome, as also appeared to be the case when larger quantities of carotene were fed or when the carotene and methyl linolenate were fed separately several hours apart. Carotene analyses of the feces showed that the differences in the growth response could not be explained on the basis of differences in the effect of the oils on the absorption of carotene.

Vitamin B₁ (thiamine chloride).—Annotated bibliography (*Rahway, N. J.: Merck & Co., 1941, [rev.], pp. [3]+140*).—This revision, dated April 1941, of an earlier bibliography (*E. S. R., 83, p. 417*) is classified under the headings chemical investigation and description, physiological activity (in vitro, bacteria, plants, experimental animals, and man), occurrence, place in nutrition, clinical uses (in beriberi, neurological diseases, cardiovascular diseases, and miscellaneous diseases and reviews), toxicity, and methods of assay (biological and chemical).

Nicotinic acid (*Rahway, N. J.: Merck & Co., 1941, pp. [2]+19*).—This supplement, dated September 1941, to the bibliography noted previously (*E. S. R., 85, p. 702*) is classified under the headings chemical investigation and description, physiological activity (animal experimentation, man, and bacteria), occurrence, place in nutrition, clinical uses (in pellagra, neurological diseases, and miscellaneous conditions), and methods of assay (chemical and biological).

The effect of a nicotinic acid deficiency upon the coenzyme I content of the human erythrocyte and muscle, A. E. AXELROD, T. D. SPIES, and C. A. ELVEHJEM. (*Wis. Expt. Sta.*). (*Jour. Biol. Chem., 138 (1941), No. 2, pp. 667-676*).—Erythrocyte and muscle coenzyme I values were obtained by methods previously described (*E. S. R., 82, p. 727*) for a series of normal and pellagrous subjects and for the latter after the administration of nicotinic acid pyrazinemonocarboxylic acid, and coramine. In addition, in vitro synthesis of coenzyme I in defibrinated blood from normal subjects by nicotinic acid amide, coramine, quinolinic acid, and pyrazinemonocarboxylic acid was attempted.

The coenzyme I content of the erythrocytes showed no significant decrease and that of the striated muscle a significant decrease in advancing stages of pellagra. Values for the erythrocytes averaged 55 μ g. per cubic centimeter in 45 normal controls and between 70 and 90 μ g. in 5 cases of severe pellagra. Striated muscle values showed a decrease from an average of 382 μ g. per gram of fresh muscle in 9 normal subjects to 214 μ g. per gram in 5 severe cases of pellagra. All three forms of therapy improved the clinical condition of pellagrins. Nicotinic acid therapy brought about an increase in the coenzyme I content of both erythrocytes and muscle, coramine resulted in no change in the 1 patient studied, and pyrazinemonocarboxylic acid an increase in erythrocyte values in 1 and in muscle values in another of 3 patients studied. Of the four compounds tested only nicotinic acid amide was capable of synthesizing coenzyme I in defibrinated blood.

Pantothenic acid requirement of the rat, K. UNNA (*Jour. Nutr., 20 (1940), No. 6, pp. 565-576, figs. 3*).—Pantothenic acid prepared from pure "natural" α -hydroxy- β , β -dimethyl- γ -butyrolactone, and β -alanine was used in curative and

prophylactic tests on rats maintained on a synthetic vitamin B complex-free diet supplemented with the synthetic crystalline factors of the B complex, 40 μ g. each of thiamin, riboflavin, and vitamin B₆ and 5 mg. of choline chloride per rat per day, with, in some cases, a further supplement of 0.5 mg. of nicotinic acid amide.

On the basal diet alone young rats ceased to grow after 3 or 4 weeks, and starting at the second week developed a rough, thin fur with rusty spots, excessive nasal secretion, sores around the mouth, and blood caking on the whiskers. The survival period ranged from 25 to 60 days. On autopsy, some of the animals showed hemorrhages under the skin and into the adrenal cortex. In curative tests, single doses were ineffective or irregular up to 840 μ g. on which 7 out of 10 rats gave a uniform growth response of about 3 gm. daily for from 4 to 5 days, with renewal of growth at about the same rate and at about the same length of time with a repetition of the dose. With daily feedings of graded doses of the pantothenic acid, 50 μ g. was required to prevent a mortality of at least 50 percent of the animals within 2 weeks. On 50, 100, and 150 μ g., 70 percent survived in each group and growth was proportional to the dose. In prophylactic tests, 80 μ g. per rat per day sufficed for optimal growth. A liver preparation containing 150 μ g. of pantothenic acid was about as effective as the same amount of the pure pantothenic acid in the curative tests but promoted growth at a greater rate in both therapeutic and prophylactic tests.

It is pointed out that almost all of the deficiency symptoms developing on the diet deficient only in pantothenic acid have been observed previously on animals on a diet devoid of the filtrate factor. The most consistent symptom observed in the present study, however, was the condition of the fur, and improvement in external symptoms with administration of pantothenic acid was most noticeable in the fur, although the response was not nearly as prompt as the improvement in the acrodynia lesions following the administration of vitamin B₆.

Effect of pantothenic acid on the nutritional achromotrichia, K. UNNA and W. L. SAMPSON (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 1, pp. 309-311).—Graying of the hair was produced within 4 weeks in approximately 80 percent of a group of black and piebald rats on a diet of vitamin-free casein 18, sucrose 67, butterfat 9, salt mixture 4, and cod-liver oil 2 percent, supplemented with thiamin, riboflavin, nicotinamide, and vitamin B. At the same time the weights became stationary and the characteristic signs of pantothenic acid deficiency, as noted above, appeared. The amount of calcium pantothenate shown in the earlier report to be essential for optimum growth, 80 or 100 μ g., prevented graying of the fur, while doses of 5, 10, or 20 μ g. were ineffective and doses of 40 μ g. gave inconsistent results. Comparable results were obtained with various concentrations of rice bran and liver, their effectiveness in preventing any graying of the hair paralleling closely their content of pantothenic acid as determined by bacteriological assay. The growth rate of rats on the rice bran was markedly superior to that of animals on pantothenic acid.

In curative tests conducted on rats which had been kept on the deficient diet for from 6 to 10 weeks, calcium pantothenate in daily doses of 100 μ g. produced a striking growth stimulation, with a somewhat slower response in the cure of external symptoms to blackening of the hair. The symmetric gray pattern disappeared gradually within from 3 to 5 weeks.

Pantothenic acid (*Rahway, N. J.: Merck & Co., 1941, pp. [3]+7*).—A supplement under the date of July 1941 to the bibliography noted previously (E. S. R., 85, p. 704).

A study of urinary riboflavin excretion in man, A. E. AXELROD, T. D. SPIES, C. A. ELVEHJEM, and V. AXELROD. (Univ. Wis. et al.). (*Jour. Clin. Invest.*,

20 (1941), No. 2, pp. 229-232).—The seven subjects in this study were patients in a Birmingham, Ala., hospital. Five in the nutrition clinic were suffering from multiple vitamin deficiency and were maintained during the period of observation on diets deficient in various members of the B complex. The other two, serving as controls, were in a good state of nutrition and were kept on the regular hospital diet. The riboflavin content of aliquots of 24-hr. samples of urine collected in dark bottles containing 1 cc. of glacial acetic acid and stored in the refrigerator under toluene was determined by the microbiological method of Snell and Strong (E. S. R., 82, p. 587). Saturation tests were also performed using 200 μ g. of riboflavin per kilogram body weight for all but one subject, who received 400 μ g. The vitamin was administered intravenously.

The average daily riboflavin excretions of the patients on the deficient diets were 59, 61, 58, 91, and 65 μ g., respectively. For each subject the variation from day to day was small. The two controls gave values of 236 and 270 μ g., respectively. No correlation could be found between the daily excretion of riboflavin and the response to the test dose. The percentages of the test dose excreted were 72 (test dose 400 μ g.), 51, 37, 63, 10, and 10 percent, respectively. Thus, the subject excreting on an average 65 μ g. and the one excreting 236 μ g. excreted the same percentage of the same test dose. In the subjects whose urines were tested at frequent intervals during the 24-hr. period, from 30 to 40 percent of the administered riboflavin was excreted within 1 hr. after injection in three subjects receiving 200 μ g. per kilogram body weight, and 42 percent within 3 hr. in one subject receiving a test dose of 400 μ g. per kilogram body weight. "The lack of correlation between the daily urinary excretion of riboflavin and the degree of retention of administered riboflavin makes it evident that the riboflavin 'saturation' test, as carried out under our conditions, has but little diagnostic value in subjects with a riboflavin deficiency which is complicated with other vitamin deficiencies."

Relation of dietary fat to riboflavin requirement of growing rats, (J. L. MANNERING, M. A. LIPTON, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (Soc. Expt. Biol. and Med. Proc., 46 (1941), No. 1, pp. 100-103, figs. 2).—The basal riboflavin-low ration K_{21} of Wagner et al. (E. S. R., 85, p. 247) and two modifications in which the fat content had been raised to 25 and 40 percent, respectively, by substituting lard isodynamically for dextrin were further supplemented by choline to the extent of 5 mg. per 100 gm. in diet K_{21} and isocaloric equivalents in the other two diets. Albino rats weighing from 60 to 75 gm. were partially depleted of their riboflavin reserves by keeping them on these three diets (12 animals on each) for 4 weeks, at the end of which time 4 animals in each group were given 3 γ and 4 6 γ of riboflavin daily and the remaining 4 continued on the same ration. The composite growth curves of each of the 3 groups showed decreased growth with increased fat content of the diet. The physical signs of riboflavin deficiency (loss of hair and dermatitis) were noted to increase in degree with higher fat content, and the animals developed a spastic gait due to a paralytic condition. Cataracts similar to those described by Day et al. (E. S. R., 78, p. 570) were observed in several of the animals on the high-fat diets. Animals in the final stages of deficiency responded to riboflavin in doses of 20 γ and 40 γ daily, with rapid increase in weight and cure of symptoms.

A second series of rats weighing from 30 to 40 gm. was partially depleted on rations K_{21} and K_{22} (25 percent fat) in which choline and vitamin B₆ had been doubled and crystalline pantothenic acid added at a level of 500 γ per 100 gm. of the ration. At the end of 2 weeks the rats on diet K_{21} weighed less than those

on the low-fat diet K_{21} . Riboflavin was then fed at levels of 0 γ , 6 γ , 18 γ , and 54 γ per day for 5 weeks. The animals receiving no riboflavin showed greater gains on the low-fat diet than on the high. The differences became less with increasing riboflavin supplements. On 18 γ the growth was only slightly less on the high-fat than on the high-carbohydrate ration and on 54 γ was equally good on both.

From these tests and an additional free-choice test in which rats which had been kept on a high-fat diet voluntarily selected the high-carbohydrate diet in preference to continuing on the high-fat diet, the authors conclude that fat has an antagonistic effect on riboflavin and suggest two possible explanations for further consideration, namely, "(1) increasing the level of fat in the diet may alter the intestinal flora so that less than normal bacterial synthesis or more than normal bacterial destruction of riboflavin occurs, or (2) riboflavin may be directly concerned with fat metabolism or phosphorylation."

[Avitaminosis, XX-XXII]. (Ark. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 5, pp. 445-452, 453-460; 22 (1941), No. 3, pp. 295-301, fig. 1).—In continuation of the series (E. S. R., 78, p. 891), three papers are presented.

[XX]. *The sparing action of thiamine on body tissue catabolism*, B. Sure and M. Dichek.—In this extension of earlier work on the specific effect of vitamin B_1 on growth (E. S. R., 68, p. 705), in which concentrates of the vitamin were employed, the same paired feeding technic with slight modifications was followed with the various B vitamins supplied as far as possible in the pure form.

In three series of tests employing two different diets, weight losses were compared of animals receiving no thiamin and their paired mates receiving the same quantity of the basal diet supplemented with 20 μ g. daily of thiamin. The weight losses of the thiamin-deficient animals were more than four times as great as those of the controls, thus showing a pronounced sparing effect of the thiamin on tissue metabolism. In another series a similar comparison was made of animals receiving enough thiamin for slow but not optimal growth with paired mates receiving 20 μ g. of thiamin. There were no marked differences in growth rates of the animals in each pair, but in a subsequent period in which no thiamin was administered the losses in weight were much greater in the animals which had received the suboptimal dosage of thiamin. In a final series one animal in each pair received a maintenance dose and the other 20 μ g. of thiamin daily. The extra amount of thiamin in this case promoted no additional growth.

[XXI]. *Riboflavin as a factor in economy of food utilization*, B. Sure and M. Dichek.—In this study, in which the authors had the assistance of M. M. Citron, the same general technic in paired feeding was followed as in the previous study, with two series of experiments on three diets differing in their sources and proportions of the various constituents of the B complex other than riboflavin. Riboflavin was administered to all controls in 20- μ g. daily doses. On all of the diets there was some growth without the added riboflavin, thus indicating that the diets were not absolutely free from this factor. However, the growth was in all cases much greater for the controls than for the animals receiving no additional riboflavin. At the end of the experiment 20 pairs of rats selected from the two series were analyzed for changes in body weight and composition of body gains. In total gains in weight and in fat and protein gains the riboflavin-fed animals exceeded the controls, the gains being particularly marked in the fat. Changes in the ash content were too small to be considered of any significance. Attention is called to similar results reported earlier by Braman et al. (E. S. R., 73, p. 414) in spite of the fact that the earlier studies were conducted before pure riboflavin was available.

[XXII]. *Further observation on riboflavin as a food factor in economy of food utilization*, B. Sure.—In this extension of the above study, evidence was obtained indicating that the final collapse in riboflavin deficiency in rats is not associated, as in thiamin deficiency, with anorexia and failure to eat. There may be a moderate reduction, no reduction, or even an increase in food consumption in the final stages. It was found preferable to use somewhat larger animals, 55–70 gm. initial weight, than in the earlier study in order to demonstrate the greatest influence of riboflavin on food utilization. In the 10 pairs of rats used in the present study the average gains in body weight during an average experimental period of 125 days were 6.1 gm. per rat for the riboflavin-deficient animals and 61.3 gm. for the animals receiving 20 μ g. of riboflavin daily.

The pathological symptoms noted in the riboflavin-deficient animals are described as "alopecia, frequently accompanied by dermatitis and ulcerations in the denuded areas, rough hair, conjunctivitis, and keratitis, occasionally associated with a discharge of a granular exudate, and in the terminal stages, muscular incoordination evidenced by the animals walking on their tiptoes and their inability to balance properly on the hind legs. Premature senility is apparent in all cases of advanced stages of riboflavin deficiency."

Vitamin B₆ (pyridoxine) (*Rahway, N. J.: Merck & Co., 1941, pp. [2]+11*).—This supplement, dated August 1941, to the previously noted bibliography (E. S. R., 85, p. 703) is similarly classified. An author index is appended.

The biological estimation of pyridoxine (vitamin B₆), T. W. CONGER and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Biol. Chem.*, 138 (1941), No. 2, pp. 555–561, figs. 2).—The method described is based upon the comparative growth response of vitamin B₆-depleted rats to supplementation of the basal diet with graded doses of pyridoxin and with the substance to be assayed. Two basal rations are described, each of which contains sucrose 75, casein (Labco) 18, salt mixture 4, and corn oil 3 gm., and thiamin 0.20, riboflavin 0.30, and nicotinic acid 2.5 mg. In addition ration I contains 30 mg. of choline, and a fuller's earth filtrate of a butanol extract of 1:20 liver concentrate powder (the preparation of which is described) is administered as a daily supplement at a level equivalent to 0.4 gm. of the original powder; and ration II contains 200 mg. of choline, 0.50 mg. of pantothenic acid, and 250 mg. of the liver concentrate powder. All of the animals are given 2 drops of haliver oil weekly.

Male rats placed on the deficient rations at 21 days show a definite plateau in growth rate in 2 or 3 weeks on ration I and in from 4 to 6 weeks on ration II, at which point the supplements are fed. The growth response shows a linear relationship to the level of pyridoxin, which is customarily fed at levels of 2, 5, and 10 μ g. daily. On the rations described no dermatitis has been noted during the depletion period. If the casein level is increased to 30 percent at the expense of sucrose, typical dermatitis results in from 4 to 6 weeks. It has not yet been determined whether the higher levels of protein increase the vitamin B₆ requirement or are only related to the production of dermatitis.

The pyridoxin content as thus determined is given for a few preparations.

The distribution of pyridoxine (vitamin B₆) in meat and meat products, L. M. HENDERSON, H. A. WAISMAN, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 6, pp. 589–598).—The method of assay was essentially that of Conger and Elvehjem noted above. The growth response of male albino rats receiving the basal ration, which was devoid of vitamin B₆ but contained adequate amounts of the other vitamins, plus supplements of the meat under test was compared with the response of negative control animals receiving the basal ration only, and with that of standard controls receiving the basal ration supplemented with crystalline vitamin B₆ at levels of 50, 75, and 100 μ g.

per 100 gm. of ration. The assay period extended over 5 weeks. Meat supplements or the crystalline vitamin were added to the ration of the several groups after the first 2 weeks, which served as a depletion period on the basal diet alone.

The results of the bio-assays of the various kinds of organ and muscle tissues are reported on dry- and fresh-weight bases. Kidney and muscle were the richest sources, containing from 20 to 30 $\mu\text{g.}$ per gram dry basis (from 3 to 7 $\mu\text{g.}$ per gram fresh basis), while heart and liver were somewhat lower, with from 10 to 15 $\mu\text{g.}$ per gram dry basis (from 2.5 to 3.5 $\mu\text{g.}$ per gram fresh basis), except for one sample of beef liver which was more like kidney and muscle. Spleen, pancreas, brain, and lung were poor sources, containing less than 8 $\mu\text{g.}$ per gram on the dry basis. Of the cooked meats, the fried samples showed least destruction, but roasting and stewing caused losses of from 20 to 50 percent. Commercial processing (drying and tenderizing) of various meat samples resulted in similar losses. Fish muscle, like beef, lamb, pork, and veal, was rich in the vitamin, but dark chicken muscle was a poor source. One sample of yellow corn contained 4.8 $\mu\text{g.}$ of pyridoxin per gram, wheat germ contained 15.9 $\mu\text{g.}$ per gram, almost as much as most muscle meats (dry basis), and a sample of winter milk contained 1.3 $\mu\text{g.}$ per cubic centimeter.

Physiologic activity and clinical use of ascorbic acid (vitamin C) (*Rahway, N. J.: Merck & Co., 1941, pp. [3]+59*).—This review, dated July 1941, is classified under the headings chemical and physical properties, history, occurrence, physiologic activity, nutritional requirements, clinical uses, dosage and methods of administration, toxicity, and methods of assay. The literature references are assembled as a bibliography of 145 titles.

Coniferennadeln und deren Absude als Vitamin C-Träger [Conifer needles and their water extracts as carriers of vitamin C], A. SCHETNERT and J. RESCHKE (*Klin. Wchnschr., 19 (1940), No. 38, pp. 976-979*).—The vitamin C content, determined by a titrimetric procedure, was found to vary from 50 to 250 mg. percent in the various conifer needles analyzed; most of the samples, however, contained from 150 to 200 mg. percent. Storage of the needles resulted in destruction of vitamin C, the loss becoming appreciable upon long storage. As much as 50 percent of the vitamin was removed from pine and spruce needles by water extraction, but not more than one-third was thus removed from needles of the silver fir.

Alpha tocopherol (vitamin E) (*Rahway, N. J.: Merck & Co., 1941, pp. [2]+93*).—In this revision, dated May 1941, of the bibliography noted previously (*E. S. R., 85, p. 712*), the annotated references are similarly classified. An author index is appended.

Vitamin E activities of some compounds related to α -tocopherol, M. TISHLER and H. M. EVANS. (*Univ. Calif.*). (*Jour. Biol. Chem., 139 (1941), No. 1, pp. 241-245*).—Compounds closely related to α -tocopherol and synthesized by certain methods developed in the course of earlier investigations on vitamin K-like substances (*E. S. R., 86, p. 12*) were tested for vitamin E activity. The results of these tests are summarized as follows:

"Neither pure α -tocopherylquinone nor 2,3,5-trimethyl-6-phytyl-1,4-benzoquinone exhibits any vitamin E activity at dose levels of 100 mg., notwithstanding the fact that both substances may be readily converted to α -tocopherol in the laboratory by acidic reducing agents. 2,3,5-Trimethyl-6-(β,γ -dihydrophytyl)-1,4-benzoquinone has no vitamin E activity at a dose of 25 mg. Naphthotocopherol, prepared from vitamin K₁, has moderate vitamin E activity."

Vitamin K, H. J. ALMQUIST. (*Univ. Calif.*). (*Physiol. Rev., 21 (1941), No. 1, pp. 194-216*).—This review considers the distribution of the vitamin in plants, micro-organisms, and animal tissues; the methods of determination; the physio-

logical relationships involved in diagnostic test- and the mechanism of vitamin K action, and in vitamin K function in various hemorrhagic diseases and tendencies; and the biochemistry of vitamin K as evolved by the works of various groups in purification, identification, and synthesis of the vitamin. There are 194 references listed.

Vitamin K (2-methyl-naphthoquinone (vitamin K-active), vitamin K₁, vitamin K₂, other related substances) (*Rahway, N. J.: Merck & Co., 1941, pp. [3]+78*).—This bibliography, which supersedes the one noted previously (*E. S. R., 85, p. 713*), contains abstracts of papers which have appeared in the literature before May 1941 classified under the headings chemical investigation and description, physiological activity (in vitro, in experimental animals, and in man), occurrence, clinical uses (in the hemorrhagic diathesis of jaundice, in infants, miscellaneous, prothrombin estimation, and reviews), toxicity, and methods of assay (chemical and biological).

TEXTILES AND CLOTHING

"Particles" and their relationship to the structure of animal fibers, J. I. HARDY and T. M. PLITT. (U. S. D. A. et al.). (*Jour. Agr. Res. [U. S.], 63 (1941), No. 5, pp. 295-303, pl. 1*).—Minute structural units, termed "particles," were observed equally well in Lincoln and Karakul wool fibers subjected to disintegration by chemical means; reduction to a powder through digestion by carpet beetles, a new biological method; or grinding through a special mill and using only the resulting fine dust. Composed apparently of keratin, the particles are spherical, uniform in size, and measure approximately 0.6 μ . They are doubly refractive to polarized light and many bear pigment. Individual particles have been isolated and photographed. The particles are aligned in chains, which constitute the fibrils. The chains lie parallel to the long axis of the fibers in the cortex, but appear to twist and interlock in the medulla.

A study of sampling in cross-section measurement of wool fiber, B. BAILEY. (S. Dak. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 63 (1941), No. 7, pp. 407-415*).—The diameters and contours of wool fibers from the shoulder, middle, and thigh of fleeces of nine Nottal sheep (*E. S. R., 83, p. 756*), and at the flesh, midpoint, and tip of the fibers were measured by the cross-section method. Analyses of variance, supplemented by other statistical tests, gave results suggesting that in studies of effects of environment and feed, consideration of variation throughout the length of the fiber is of importance. Since spinnability of wool is affected by contour and diameter and their variation among and within fibers, in conducting a wool-breeding program to produce a maximum of desirable fleece qualities, diameter and possibly contour should be measured at more than one point.

Shoe sizing and fitting: An analysis of practices and trends, C. W. MOFFERT (U. S. Dept. Agr., Misc. Pub. 469 (1941), pp. [2]+31).—This exploration of present practices and trends considers the background in which they originated, and discusses how last manufacturers arrive at size and fit and how shoe manufacturers influence and retailers interpret fit. It is pointed out that standardization of tools and methods has developed manufacturing capacity that now exceeds consumer demand, that tradition still influences attitudes toward sizing and fitting shoes, and that the shoe industry because of its complexity has made no concerted effort to deal with fitting problems raised by mass production. Scientific research on new methods of foot measurement adapted to the study of a large representative sample of people and capable of producing uniform results that can be analyzed statistically is necessary for the development of new size standards. Such measurements by an agency capable of serving all

groups in the industry, as well as consumers, and the cooperative efforts of all parties concerned are needed for successful development of national standards for sizing and fitting shoes.

HOME MANAGEMENT AND EQUIPMENT

Minimum requirements for farmhouses (*U. S. Dept. Agr., Misc. Pub. 475* (1941), pp. 8).—"These minimum requirements for farm dwellings represent the judgment of Department of Agriculture agencies which have had first-hand experience with rural housing problems and have gained considerable knowledge of the kind of homes farm people want. They are based on conclusions reached after extensive study by technicians representing these agencies." Points considered include choosing a site, construction features contributing to comfort and livability, space requirements, storage space, kitchen storage, food storage, arrangement for privacy and convenience, light and ventilation, electric wiring, heating, fuel storage, water supply and sanitation, and health and safety.

MISCELLANEOUS

Agricultural research in New Hampshire: Annual report of the director of New Hampshire Agricultural Experiment Station for the year 1940, M. G. EASTMAN (*New Hampshire Sta. Bul. 330* (1941), pp. 42, fig. 1).⁶

Informe bienial años fiscales 1939 y 1940 [Biennial Report of the Puerto Rico University Station, 1939-40], J. A. B. NOLLA ET AL. (*Puerto Rico Univ. Sta. Bien. Rpt. 1939-40, Span. ed., pp. VIII+139, figs. 13*).—This report consists mainly of data previously noted from the annual reports (*E. S. R.*, 83, p. 718; 86, p. 143), with some additional data noted for the most part elsewhere in this issue.

Fifty-fourth Annual Report [of Vermont Station, 1941], J. L. HILLS (*Vermont Sta. Bul. 475* (1941), pp. 40).⁶

Mississippi Farm Research, [September 1941] (*Miss. Farm Res. [Mississippi Sta.]*, 4 (1941), No. 9, pp. 8, figs. 6).—In addition to articles noted elsewhere in this issue, there are included Adequate Rations, Comfortable Quarters, Exercise, Grazing Crops, Important in Management of Brood Sow and Litter, by P. G. Bedenbaugh (p. 2); Some Principles of Farm Woodland Management, by R. R. Reynolds (p. 6); and State Cotton Crop Smaller but of Better Quality, Longer Staple, by M. Guin (p. 7).

Bimonthly Bulletin, [September 1941] (*North Dakota Sta. Bimo. Bul.*, 4 (1941), No. 1, pp. 18, figs. 4).—In addition to several articles noted elsewhere in this issue and the customary abstracts, this number contains Sunflowers and Coneflowers of North Dakota, by O. A. Stevens (pp. 11-13).

Deutsche Forschungstätten im Dienste der Nahrungsfreiheit [German research in the service of food sufficiency], edited by H. PIEGLER (*Neudamm: J. Neumann, 1940, pp. 486, [pl. 1]*).—This is a classified list of about 1,300 German institutions carrying on research related to food production and utilization. Among the nine sections are those on agricultural and home management, soils and plants, forestry, animal husbandry, animal diseases, and the manufacture, nutritive value, and use of farm products. The history and scope of each institution is briefly described.

⁶ The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Illinois University and Station.—An Illinois Soybean Day in celebration of the completion of the first decade of the history of soybeans as an important farm crop in the State was held at the university on September 25, 1941. E. L. Hansen, assistant in agricultural engineering, has resigned to engage in commercial work and has been succeeded by Frank Andrews. Jean I. Simpson has been appointed associate professor and associate chief of home economics.

Massachusetts College and Station.—Fire caused by a spark from an electrical hoist ignited hay in the main storage barn on the college farm, resulting in damage estimated at over \$25,000.

George L. Farley, 4-H Club leader since 1916 and a pioneer in 4-H work in the Nation, died September 10, 1941, at the age of 68 years. During the quarter century of his service the club enrollment in the State rose from a few hundred to over 20,000 members.

Missouri Station.—Four new projects have been started which have a bearing on the national defense program. One of these deals with Missouri ticks and their control and aims to develop farm practices and other suppressive measures for reducing tick injury to livestock and man in the Ozarks. Special significance attaches to this project since Fort Leonard Wood is located in the area and Camp Crowder is under construction there.

Another project has to do with successful farming systems for small farms. The main object of this project is to determine the system of management on small farm units which seem to be yielding income to support acceptable levels of living for the farmer and his family. A large number of farm families are being displaced in connection with the defense program, and this project should be of material aid in working out a policy for resettlement.

The remaining projects have to do with nutrition of vegetables and their dietary value as influenced by soil treatments, and the vitamin potency of pork as influenced by the rations.

New York State Station.—Six months' leave of absence has been granted Dr. Robert S. Breed, head of the division of bacteriology. During this time he will undertake a field survey of dairy research and education in certain Central and South American countries for the Inter-American Committee for the Dairy Industry. A special study will be made of the status of public health activities relating to the handling of milk and other dairy products in the various countries, with visits to dairy research institutes, agricultural colleges and other agricultural centers, commercial dairy and dairy manufacturing plants, and dairy farm regions to gain first-hand knowledge of dairy practices and the dairy industry as a whole.

Ohio State University and Station.—Dr. C. W. Hauck, associate professor of rural economics and assistant in the station, has been granted a year's leave of absence effective October 1, 1941, to join the staff of the U. S. Office of Production Management. Recent additions to the station staff include Dr. Walter Krill as associate in animal industry and the following assistants: Dr. Alvin Wolfe, horticulture; Dr. J. B. Polivka, entomology; Dr. Raymond E. Cray, animal industry; and John Hibbs, dairy.

Oklahoma College and Station.—A department of home economics research has been established. This will be headed by Dr. Williamina A. Armstrong, instructor and assistant in home economics in the Illinois University and Station, who will take over nutrition research formerly handled by Dr. Gladys M. Kinsman, resigned to become a member of the Women's College, University of North Carolina. Home economics research has previously been administered under the department of agricultural chemistry. It is planned that the new department will assist with, and eventually expand, the textile research now being done by the department of agronomy in connection with the cotton quality work.

Drs. James A. Whatley, Jr., assistant professor of animal husbandry, and Lewis H. Moe, associate professor of bacteriology and veterinary medicine, have been called to active duty as reserve officers in the U. S. Army. Dr. Charles S. Hobbs has been appointed assistant professor of animal husbandry, and Dr. H. C. Smith assistant professor of veterinary medicine.

Tennessee Station.—Equipment of modern design for conducting experimental freezing and cold-storage tests on fruits, vegetables, and meats has been installed in the new agricultural engineering building. Varieties of each of the well-known and the newly developed kinds of fruits and vegetables grown in the State will be quick-frozen, held in cold storage for definite periods of time, and tested in various ways to determine their nearness to garden-fresh quality in taste, color, texture, and nutritional value. The methods developed are to be so standardized as to be reproducible both in the freezer-locker plants, of which there are already 27 in Tennessee, and the freezer-storage cabinet of the home.

Utah Station.—Herbert C. Folken has been appointed State representative of the U. S. D. A. Bureau of Agricultural Economics vice Dr. Dilworth Walker, resigned to become head of the department of economics and acting dean of the School of Business of the University of Utah. Max Beal has been appointed research assistant professor of agricultural marketing.

Virginia Station.—J. W. Weaver, Jr., has been appointed associate agricultural engineer effective October 1, 1941. John W. Sjogren, assistant agricultural engineer, has been transferred to full-time teaching duties. Other appointments include C. S. Coleman as assistant agronomist (soil survey) and Emanuel Azar as acting soils technologist vice H. T. Rogers, who is on educational leave.

West Virginia University and Station.—A number of new buildings were provided by the 1941 legislature, including a poultry building to cost \$15,000, a live-stock judging pavilion \$12,500, a dairy barn \$8,500, a home demonstration practice house \$12,500, a hardening room for the creamery \$700, and a storage shed \$1,000. Grants were also made of \$5,000 for equipment, \$1,000 for repairs and improvements to farm buildings, \$8,500 for the purchase of a farm of 252 acres for animal husbandry work, and \$6,500 for additional land for dairy pasture. Low-income farm studies, including the sociological and economic phases, are to be begun, as well as additional research in foods and an expansion of wildlife studies. A new weekly release of station information has been started under the title *Epistle to Farm News*.

L. F. Miller has been appointed assistant agricultural economist.

EXPERIMENT STATION RECORD

VOL. 84

APRIL 1941

No. 4

THE SCOPE AND USE OF EXPERIMENT STATION RECORD

Although the *Record* is now well along in its second half century and its major policies and procedures have been standardized for many years, inquiries are frequently received which indicate a need for a brief discussion as to the scope of this publication and how to use it. The following statement has been prepared mainly to meet these specific objectives.

As its name implies, *Experiment Station Record* is first of all a record of experiment station accomplishments. This record is derived from the stations' published material, including not only what is issued by the stations themselves but all identifiable research contributions by members of their staffs to scientific journals and other mediums of publication. Special efforts are made to obtain and abstract the station series as promptly and regularly as possible.

Under ordinary circumstances about half of the approximately 138 pages available in each issue of the *Record* are required for the station material. Another substantial portion is occupied by the research contributions from the Federal Department of Agriculture, which in general receive the same priority and are handled in the same way as those of the stations. The most important distinction is that resulting from the fact that the Department is more than a research agency. In consequence much material which it issues is along lines outside the scope of the *Record* and is therefore not included in its review.

Such space as still remains is available for abstracts of selected article from nonstation and non-Department sources. Thirty years ago a reasonably complete coverage was possible for all articles of interest to agricultural research. In 1911, however, the year in which the present space limits were established, the State experiment stations had a total aggregate income of \$3,662,425 and technical staffs aggregating 1,564 employees. In the fiscal year 1940, the comparable figures were \$21,216,749 and 4,593 technical employees. This change alone illustrates some of the difficulties in maintaining a coverage as comprehensive as formerly.

In order to conserve space, numerous alterations and procedures have been introduced from time to time. One radical departure of the past decade has been in the method of handling the station annual reports. Here the assumption has been made that such publications are essentially progress reports and that consequently detailed abstracting may be deferred until the results are presented more formally elsewhere. However, an enumeration is attempted of all findings which are reported, thereby securing an index reference both by subject and author for the use of those interested in following the progress of a specific project. More recently, increasing use of title references, with or without annotations, and of descriptive abstracts has been resorted to when deemed practicable and especially in connection with association proceedings. Largely because of these changes and the assignment of less space to editorials and news notes, over 500 more abstracts were published in 1940 than in 1911.

At the present time, it is believed that the major research developments in agriculture and home economics are being placed on record, though in some cases in insufficient detail, for the United States and Canada, and for other parts of the British Empire to the extent that this research is widely applicable to conditions in this country. Special attention is also being given to contributions from Central and South America. For the remainder of the globe it is doubtful if adequate coverage can be achieved under existing conditions, although the attempt is made to locate and make available the more outstanding additions to knowledge.

Aside from the station and Department publications and a considerable number of direct exchanges, by far the principal channel through which material becomes available for abstracting is the Department Library, which has been traditionally most cooperative in facilitating the *Record* work. Since the entire Library resources are available and selection is made by a process of sifting of individual issues, no separate list is maintained of periodicals abstracted in the *Record*, but a guide to the Library receipts is issued from time to time by the Department Library under the title *List of Periodicals Currently Received in the Library of the United States Department of Agriculture*. The latest issue of this list bears the date of June 1, 1936, contains 3,871 titles of periodicals with addresses of publishers, and is still available as *Miscellaneous Publication 245* of the Department. A supplement is now in press.

Another Department publication of direct value to users of the *Record* is *Miscellaneous Publication 337, Abbreviations Used in the Department of Agriculture for Titles of Publications*. This publication, issued in 1939, has superseded *Department Bulletin 1330, Abbreviations Employed in Experiment Station Record for Titles*

of Periodicals. This also is an address list, and includes a key for single words which is especially helpful in identifying publications too recent to be specifically included. Although the Office of Experiment Stations is always glad to be of service along bibliographical lines, it is thought that the acquisition and use of these two Department publications would obviate many inquiries as to what publications may be abstracted in the *Record*, the full titles of these publications, and where the publications may be obtained.

Probably the most difficult of fulfillment are the requests received by the Office which ask for copies of the original publications from which abstracts are made. The foregoing discussion indicates the virtual impossibility of complying with most requests of this type. Seldom does the Office have available for distribution copies of any publications which are abstracted aside from the relatively few which it itself issues, notably the annual report on the agricultural experiment stations and the annual report of the Chief of the Office.

In general, requests for other publications of the Department should be made to the Office of Information. The publications of the State experiment stations are distributed only by the individual institutions, an address list of which appears as page 3 of the cover of each issue of the *Record*. Books and periodicals must usually be purchased from the publishers or their agents, although separates of articles are sometimes obtainable from authors or their institutions. Many publications are of course available for consultation in libraries, and it is not always realized that the Union List of Serials in Libraries of the United States and Canada and its supplements may be of much help in locating libraries where specific publications may be found.

Probably the most striking development in documentation aids in recent years has been the application of photography to the making of copies. Through the operation of Biblionfilm Service by the American Documentation Institute in cooperation with the Department Library, photographic reproductions may now be obtained for purposes of research for virtually any article abstracted in the *Record*. These reproductions are available in two forms, photo-prints, which can be read without magnification, and microfilm furnished at much lower cost but requiring a magnifier or projecting apparatus. Order blanks and details for this service can be obtained from the Biblionfilm Service, care of the Library, U. S. Department of Agriculture, Washington, D. C. It is believed that for certain types of articles, such as short papers appearing in voluminous or relatively inaccessible proceedings, this service has many advantages.

The classification of abstracts in the *Record* follows a plan of many years' standing, and it is the endeavor to maintain consistency of

reference and uniformity of treatment. It cannot be emphasized too frequently, however, that many abstracts are of interest to users of other sections than those in which they appear. So complex are modern research interrelations that not even cross references can be expected to encompass complete knowledge within a single section, and it is largely to avoid the creation of a false sense of security that cross references are not employed in the *Record*. To obtain a complete picture, the poultry husbandman should extend his reading beyond the section of Animal Production at least to that of Veterinary Medicine, Genetics, and Agricultural Economics. The soil conservationist cannot hope to find all material of interest in the section on Soils, but should browse currently into the sections of Agricultural Meteorology, Agricultural Botany, Field Crops, Forestry, Agricultural Engineering, Agricultural Economics, and even Rural Sociology. Ultimately, of course, the subject indexes are available regardless of sectional lines, but in the use of these indexes the precaution should still be taken to avoid too narrow a conception of the terminology.

For those who are endeavoring to use the *Record* as a guide to research accomplishments of the past half century, the most rapid method of approach is usually through the combined subject indexes. There are now six of these indexes, and it is the policy to add others at approximately 5-year intervals. Unfortunately the second of the group, covering volumes 13-25, is no longer available, but the remainder, covering volumes 1-12, 26-40, 41-50, 51-60, and 61-70, can still be obtained free of charge by libraries and for institutional use, as well as through purchase from the Superintendent of Documents. The Office of Experiment Stations is always glad to cooperate to the extent of its facilities in the completion of files for both the general indexes and the individual volumes.

In conclusion, suggestions as to ways to improve the *Record* and extend its usefulness are appreciated. Continuity and consistency of policy is so important in an abstract journal of this kind that changes are not always practicable. The attainment of maximum service, however, is the ideal underlying its operation, and constructive criticism to bring this about will not only be welcome but will receive full and sympathetic consideration.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations by the New Haven Station] (*Connecticut [New Haven] Sta. Bul.* 438 (1940), pp. 497-499).—Notes are given on amide synthesis in the tobacco leaf and rhubarb leaf, and on the effect on plants of isotopic nitrogen.

Biochemical studies of some varieties of apples, plums, and grapes grown in Minnesota, E. O. BARNES (*Minnesota Sta. Tech. Bul.* 173 (1940), pp. 35, figs. 8).—The author determined the titratable acidity, pH values, titration curves, and buffer-system characteristics of the juices of various apples, plums, and grapes as grown under Minnesota conditions. The crude pectin content (as indicated by alcohol precipitation) of the apple juices was determined, together with total astringents, astringent nontannins, and tannins in the juices of the plums and grapes and their relative proportions of acid, sugar, and astringent substances.

The indications of these data suggest the desirability of carrying out similar studies over several crop seasons. "Such studies should (1) assist in separating environmental and seasonal factors from genetic behavior, (2) indicate those varieties which exhibit a relatively stable constitution insofar as fruit composition is concerned, and (3) perhaps indicate genetic combinations which will assist the fruit breeder in developing varieties of fruits suitable for specific purposes. . . . If [for example] a desirable grape with a sugar content stabilized at approximately 17 percent can be grown in Minnesota, it might well provide raw material for a local wine industry."

Inversion of sucrose in the different parts of the sugarcane stalk, J. I. LAURITZEN and R. T. BALCH (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 1, pp. 1-16, figs. 3).—There was less inversion of sucrose in all samples stored at high relative humidities than in corresponding samples stored at low r. h. In general, the rate of inversion of sucrose was correlated with the rate of loss of moisture. In most instances there was more total loss of moisture and inversion of sucrose from the three sections made of samples when sectioned before storage than when sectioned after storage. The exception seemed to be due to the lack of uniform exposure of samples to evaporation. In cane stored as whole stalks there tended to be a gradient in the percentage of loss of moisture, percentage of increase in Brix, drop in purity, and percentage of loss of sucrose. These changes were greatest in the top, next greatest in the middle, and least in the bottom section. In cane sectioned before storage these changes tended to be greater in the top and bottom sections than in the middle section. In the variety P. O. J. 36-M there was greater inversion in the unsevered top third of the stalks than in the severed top third. During the early periods of storage, however, there was greater inversion in the severed bottom third than in the unsevered bottom third, the difference decreasing and sometimes disappearing with lapse of time. The behavior of the variety Co. 290 was similar to that of P. O. J. 36-M except that the differences were not so marked, and after the

first period of storage there was a decrease in the difference in the top sections instead of in the bottom sections.

Density of dry milk solids, O. E. STAMBERG and C. H. BAILEY. (Minn. Expt. Sta.). (*Food Res.*, 5 (1940), No. 3, pp. 275-280, fig. 1).—The method developed for determining density of dry milk solids consisted in weighing 7 gm. of dry milk solids into a 50-cc. sedimentation tube, adding a mixture of naphtha and carbon tetrachloride having a density of 1.250 at 25° C. to the 50-cc. mark, shaking, and allowing to stand for 45 min. A precipitate having a density above 1.250 was then read to the nearest tenth of a cubic centimeter. The value thus obtained times 10 is considered the density index. Data are presented on the density of 30 samples of spray-process dry milk solids. The density index of these samples ranged from 125 to 24, the variation being due apparently to occluded air cells. Practically no air cells were observed in the particles dried by the roller process.

Estimation of submicroquantities of calcium, A. E. SOBEL and I. A. KAYE (*Indus. and Engin. Chem., Analyt. Ed.*, 12 (1940), No. 2, pp. 118-120).—By the method described, submicroquantities (0.004-0.040 mg.) of calcium are determined titrimetrically with the use of an ordinary 5- to 10-cc. microburette. The calcium, precipitated as the oxalate in a specially designed centrifuge tube, is converted to the carbonate by heating at 475°-525° C. The carbonate is dissolved in an excess of 0.01 N hydrochloric acid by heating, the excess HCl then being determined iodometrically by the addition of an excess of potassium iodate and potassium iodide, this resulting in the release of iodine equivalent to the excess acid. The iodine is determined by titration with approximately 0.0007 N sodium thiosulfate, using starch as an indicator. "This procedure retains the theoretical and practical advantages of the methods where calcium oxalate is converted to calcium carbonate and combines with it the sensitivity of iodometric titrations. All solutions are standardized against the relatively stable 0.01 N hydrochloric acid used."

A method for rapid determination of magnesium in body fluids and some preliminary results on clinical material, B. CASSEN (*Jour. Lab. and Clin. Med.*, 25 (1940), No. 4, pp. 411-413, figs. 2).—The rapid spectrographic method described involved the use of 1 or 1.5 cc. of the body fluid diluted with distilled water to 15 cc., this whole amount then being sprayed directly into and on the surface of the electrodes of a carbon spark. While the solution was being sprayed through the spark (pressure regulator on the oxygen tank and atomizer jets adjusted so that 2 min. was required), an exposure was made on an Eastman O-III ultraviolet plate in a small quartz spectrograph. Calibrating exposures were made on each plate with solutions of magnesium chloride containing 1 mg., 0.5, and 0.25 mg. per 100 cc., respectively. The density of the magnesium 2,795.5 line (having the correct range of density for usual concentrations of magnesium in whole blood, blood plasma, cerebrospinal fluid, bile, etc.) was determined with a Hartmann comparator. In about 50 determinations on human blood values of 3-4 mg. per 100 cc. of blood plasma or 6-7 mg. per 100 cc. of whole blood were obtained. Cerebrospinal fluids averaged about 3 mg. per 100 cc.

Crystalline vitamin A palmitate and vitamin A alcohol, J. G. BAXTER and C. D. ROBESON (*Science*, 92 (1940), No. 2383, pp. 203, 204).—The preparation of vitamin A alcohol from rich fish-liver oils is reported. The oils were distilled in a cyclic molecular still, and fractions with extinction coefficients at 328 m μ of 400 or greater were combined and saponified. The vitamin A alcohol concentrate thus obtained was crystallized from ethyl formate (or propylene oxide) at -35° C. and dried in vacuum at low temperature. The solvent-free, pale yellow prismatic

crystals of the vitamin A alcohol melted at 63°–64° and had an average extinction coefficient at 328 $m\mu$ of 1.725. An average value of 4,700 for $E_{1\%}^{1\text{cm}}$ (622 $m\mu$) was obtained for the extinction coefficient of the vitamin A alcohol blue color with antimony trichloride. Preliminary biological assay of the vitamin A alcohol indicated a potency greater than 2,700,000 U. S. P. units per gram. Vitamin A palmitate was prepared by esterifying crystalline vitamin A alcohol with palmityl chloride and quinoline in chloroform solution at –15°. The crude ester crystallized from a 2 percent solution in propylene oxide at –30°, and gave pale yellow plates melting at 26°–28° and having an average extinction coefficient of 940. The extinction coefficient of the antimony trichloride blue color with crystalline vitamin A palmitate was found to be 2,490 at 620 $m\mu$. The vitamin A alcohol, its crystalline palmitate, distilled esters from a fish-liver oil, vitamin A 2-naphthoate, and β -carotene were found to be equally stable when stored in refined cottonseed oil (at comparable concentrations) exposed to air in the dark.

Assay of a variety of vitamin B₁ preparations by the fluoro-photometric method, J. W. COLE, W. S. JONES, and W. G. CHRISTIANSEN (*Jour. Amer. Pharm. Assoc.*, 29 (1940), No. 10, pp. 434–436).—This paper reports the successful application of the method of Hennessy and Cerecedo (*E. S. R.*, 82, p. 588) to a wide variety of raw materials, mixtures, and finished products, the latter including complex multivitamin preparations such as the various pastes in capsules. The data reported indicate good agreement between results obtained by the chemical method and those obtained by direct bio-assay of the product, or calculated from the potencies of the components as determined by bio-assay. The preparation of the samples, the most important and often the most difficult part of the procedure, varies from preparation to preparation, and is not reported. It is pointed out, however, that this was successfully accomplished as indicated by the assay results.

The quantitative determination of vitamin C in the urine [trans. title], T. NAGAYAMA, T. TOMOI, and T. SAGARA (*Biochem. Ztschr.*, 303 (1940), No. 5–6, pp. 354–363).—In the method described phosphotungstic acid is used to precipitate nonspecific reducing substances other than glutathione, cysteine, and thiosulfate, which are considered to be present in normal urines in too small amounts to introduce errors in the indophenol reaction. After removal of the precipitate the resulting water-clear solution gives a sharp end point in the titration. In practice 20 cc. of urine is first treated with 2 cc. of 20 percent metaphosphoric acid, 3 cc. of a 10 percent phosphotungstic acid solution (10 gm. of phosphotungstic acid + 25 cc. of H_2SO_4 , sp. gr. 1.105, made up to 100 cc. with water) is added, and the mixture is centrifuged for 5 min. The supernatant liquid is then titrated against 4 cc. of 2 mg. percent 2,6-dichlorophenolindophenol. Data are given showing quantitative recovery of added ascorbic acid by this method with undiluted and diluted urines, and satisfactory agreement in results obtained by this method and the fermentation method. It is also noted that urine treated with 5 percent metaphosphoric acid and phosphotungstic acid solution and placed in the ice box retains 95 percent of its ascorbic acid activity after 24 hr.

The synthesis of vitamin K₁, L. F. FIESER (*Science*, 91 (1940), No. 2350, pp. 31–36).—An address summarizing the discovery, isolation, identification, and synthesis of vitamin K.

The oxidation-reduction potential of vitamin K₁, B. RIEGEL, P. G. SMITH, and C. E. SCHWEITZER (*Jour. Amer. Chem. Soc.*, 62 (1940), No. 4, p. 992).—The oxidation-reduction potentials of the vitamin in potent alfalfa concentrates prepared according to the method of Riegel et al. (*E. S. R.*, 83, p. 445) and of the synthetic vitamin prepared according to the method of Fieser (*E. S. R.*, 83, p. 735) were determined; values of 358 and 363 mv., respectively, were obtained

for E_0 against the hydrogen electrode at 20° C. In the solvent used, 95 percent ethanol, 0.2 N in hydrochloric acid, and 0.2 N in lithium chloride, the solubility of the vitamin was found to be about 5 mg. per cubic centimeter at room temperature.

Further compounds having antihemorrhagic activity, L. F. FIESER, M. TISHELER, and W. L. SAMPSON (*Jour. Amer. Chem. Soc.*, 62 (1940), No. 4, p. 996).—By using 1,4-naphthohydroquinone as one component, 2-geranyl-, 2-farnesyl-, and 2-phytyl-1,4-naphthoquinone were synthesized in good yield by the method of Fieser et al. (*E. S. R.*, 83, pp. 586, 735). The phytyl compound, the most active of the three, gave full response in the chick assay at 50 γ ; similarly the 3-farnesyl derivative of 2-methyl-1,4-naphthoquinone was more potent than the 2-geranyl derivative but somewhat less active than vitamin K₁. Other compounds synthesized and their respective activities as determined are as follows: 2,3,5-trimethyl-6-phytyl-1,4-benzoquinone, no vitamin K activity; 2-methyl-3-phytyl-5,8-dihydro-1,4-naphthoquinone, active at a level of 5 γ –6 γ ; the β,γ -dihydride of the synthetic vitamin K₁, active at 6 γ as the hydroquinone diacetate; the $\beta,\gamma,\delta,\epsilon,\zeta,\eta$ -hexahydride of the vitamin, slight activity as the diacetate derivative; butadiene-toluquinone, marked activity; 2-methyl-5,8-dihydro-1,4-naphthohydroquinone, marked activity in dosages as low as 8 γ ; and 2,4-dinitrophenylhydrazine, moderate activity.

Soybean oil and soybean protein, H. L. WALSTER (*North Dakota Sta. Bimo. Bul.*, 3 (1940), No. 2, pp. 5–7).—This short article comprises a brief partial summary of the industrial uses of soybean meal, oil, and proteins, and some discussion of varieties suitable for North Dakota agricultural conditions, including analyses.

Investigations in the sulfuring of fruits for drying, J. D. LONG, E. M. MRAK, and C. D. FISHER (*California Sta. Bul.* 636 (1940), pp. 56, figs. 18).—Satisfactory sulfuring was found to require (1) absorption by the freshly cut fruit of sulfur dioxide sufficient to allow for retention of enough of the preservative to maintain high quality in the fruit after normal drying and storage losses, (2) rapid drying with low sulfur dioxide loss, and (3) storage at temperatures and humidities low enough to permit retention of the sulfur dioxide. The survey and experimental work here reported are concerned with the first two of these requirements.

It was found that in a sulfur house of construction sufficiently tight to prevent drafts, vents to provide air for burning the sulfur are necessary. For the type of vents recommended, a fixed ratio must be maintained between the vent area and the surface area of the sulfur burner. Doors hinged at the side and secured with refrigerator-type latches are preferable to vertical sliding doors or those hinged at the top when the door opening does not exceed 4 ft. For wider openings a door hinged at the top and secured against the jambs with refrigerator-type latches is preferable. The interior surfaces of sulfuring compartments should be painted with acid-resistant paints, regardless of the construction material, for durability and to tighten the structure against air leakage.

Sulfur should be burned in a clean metal pan of 10-in. diameter or in clean concrete hearths of equivalent area. Unlined earthen pits are unsatisfactory. Insulated, regenerative, or forced-draft burners may be desirable for burning the poorer grades of sulfur, or those carrying contaminants. The black film or scum from some low-quality sulfurs consists chiefly of carbon or carbonaceous matter. Of the various kinds of organic materials added to test samples of a high-quality sulfur, petroleum oils were found to cause the formation of a black surface film most rapidly. This decreased the percentage of sulfur

burned. By increasing the temperature of poor-burning sulfurs to cause more rapid volatilization, poor-quality sulfur could be burned completely. A good grade of refined sulfur is recommended as being more economical and less troublesome than cheaper grades. The sulfur should burn completely, leaving not more than 1 or 2 oz. of residue from the standard 4- or 5-lb. charge.

The temperatures at various points in the sulfur house commonly showed a difference of 20° F. between ceiling and floor. Sulfuring fruit at the relatively high temperatures of 100°–120° tends to decrease absorption but increases retention of sulfur dioxide. Fruits sulfured at high temperatures, however, bleed more readily than when sulfured at lower temperatures.

The freshly sulfured fruit should be dried as rapidly as possible. Every possible advantage should be taken in the location of the drying yard, and in placing the fruit on the drying field, to maintain conditions favorable to rapid moisture evaporation. Dehydration offers definite advantages in coastal areas where climatic conditions during the drying season are unfavorable to the production of a high-quality product.

AGRICULTURAL METEOROLOGY

Weather analysis and forecasting: A textbook on synoptic meteorology. S. PETERSEN (*New York and London: McGraw-Hill Book Co., 1940, pp. XVI+505, figs. 249*).—The author has endeavored to meet a widespread demand by presenting in comprehensive form the results of recent researches, scattered in many papers and journals (91 references), setting forth the principles and theories underlying the modern methods of weather analysis and forecasting and in such a manner that their application to actual forecasting may be facilitated. The 11 chapters deal, respectively, with air-mass characteristics; stability and instability in relation to weather phenomena; production and transformation of air masses; kinematic analysis—wind and pressure; kinematic analysis—frontogenesis; frontal characteristics; waves and cyclones; isentropic analysis; forecasting of displacement of pressure systems, fronts, and air masses; deepening and filling; and the technique of analysis and forecasting. A list of the meteorological stations of the world and author and subject indexes are included.

The geographic-complex method for the study of climate. I. K. ТИХОМІРОВ (*U. S. Mo. Weather Rev., 68 (1940), No. 8, pp. 214–216*).—This paper aims to present the general ideas of the proposed method and to show in broad outline a practical way of developing it. The complexity of the relation between climate and landscape is fully appreciated, but the multitude and variety of the objects in nature that reflect climate provide a wide and promising field for search after the indicators of climate in the landscape. It is believed that such a search, properly organized and employed on a large scale, will reveal means for simplifying the entire problem and will also yield considerable accessory information toward the practical realization of the proposed method of climatological investigation.

Reliability of station-year rainfall-frequency determinations. K. CLARKE-HAFSTAD. (U. S. D. A.). (*Amer. Soc. Civ. Engin. Proc., 66 (1940), No. 9, pp. 1603–1622, figs. 2*).—The author discusses the factors affecting the accuracy of rainfall frequency determinations and suggests a method involving a statistical test for persistence in estimating the reliability of frequencies calculated by the station-year method. It is emphasized that the accuracy of rainfall frequency values should be considered carefully in designing flood and erosion control structures.

Water planning and rainfall: The story behind Minnesota's water supply, W. S. OLSON (*Conserv. Volunteer*, 1 (1940), No. 1, pp. 10-12).—A semipopular summary of meteorological data for the State over a period of years.

The analysis of hydrologic data for small watersheds, W. W. HOENER (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1940, *SCS-TP-30*, pp. [5]+103, figs. 14).

Hydrologic studies: Compilation of rainfall and run-off from the watersheds of the Missouri Valley Loess Region Conservation Experiment Station, Clarinda, Iowa, 1939, L. H. SCHOENLEBER (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1940, [*SCS-TP-31, Sup.*], pp. [33], figs. 24).—This supplements the data for 1934-38 (*E. S. R.*, 83, p. 590).

Hydrologic studies: Compilation of rainfall and run-off from the watersheds and terraced areas of the Fort Hays Conservation Experiment Station, Hays, Kansas, 1930-38, R. R. DRAKE, S. A. MICHAEL, and R. O. BAUM (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1940, *SCS-TP-37*, pp. [202], figs. 137).

Monthly Weather Review [July-August 1940] (*U. S. Mo. Weather Rev.*, 68 (1940), Nos. 7, pp. 181-209, pls. 12, figs. 4; 8, pp. 211-239, pls. 12, figs. 6).—In addition to the usual detailed summaries of meteorological and climatological data, including observations on aerology, weather on the Atlantic and Pacific Oceans, and rivers and floods; solar radiation and sunspot data; and other information, these numbers contain an article noted on page 441 and the following contributions:

No. 7.—Night Radiation and Unusual Minimum Temperatures Near New Orleans, La., by W. F. McDonald (pp. 181-185); and Radiative Cooling in the Lower Atmosphere, by W. M. Elsasser (pp. 185-188).

No. 8.—Wind Force and Exceptional Visibility at Sea, by I. R. Tannchill (pp. 211-213); and Tropical Disturbances of August 1940, by J. H. Gallenne (pp. 217, 218).

SOILS—FERTILIZERS

[Soil investigations by the New Haven Station] (*Connecticut [New Haven] Sta. Bul.* 438 (1940), pp. 520-524, 525, 526).—These have included a study of 12 humus materials with reference to the development of Connecticut muck and peat resources to replace imports no longer available, soil leaching studies, fertilizers for vegetable crops, boron deficiency in soils, apple-root and soil-moisture studies, fertilizer ratios, response of ash trees to soil fertility in station frames, chemical fertility of pasture and vegetable field soils, soil fertility studies in the forest nursery, and forest lysimeter studies.

[Soil investigations by the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 399 (1940), pp. 18-21).—Yield increases of corn, oats, wheat, and hay from phosphate applications are reported by C. F. Noll, and correlation of soil nitrogen with yields, nitrogen fixation by micro-organisms, and plant growth as an index of soil fertility, all by J. W. White. Mineral differences among soils are noted by C. D. Jeffries.

[Illinois soil reports] (*Illinois Sta. Soil Rpts.* 67 (1940), pp. 28, figs. 12, maps 2; 68, pp. 27, figs. 12, map 1; 69, pp. 39, figs. 14, map 1).—These reports add three further counties to those covered by State soil survey reports previously noted (*E. S. R.*, 82, p. 154): Nos. 67, De Witt County, by G. D. and L. H. Smith; and 68, Jasper County, and 69, Cumberland County, both by R. S. and L. H. Smith.

Soil survey of Steuben County, Indiana, L. R. SMITH ET AL. (*Coop. Ind. Expt. Sta.*). (*U. S. Dept. Agr., Bur. Plant Indus. [Soil Survey Rpt.]*, Ser. 1933, No. 35, pp. 63, figs. 2, map 1).

Rain simulator studies of the effect of slope on erosion and run-off, 1938.—A preliminary report, H. L. BORST and R. WOODBURN (*U. S. Dept. Agr.*,

Soil Conserv. Serv., 1940, SCS-TP-36, pp. [54], pls. 10, figs. 12).—By means of an artificial rainfall apparatus developed by the Soil Conservation Service at the Hydraulic Laboratory of the National Bureau of Standards, the amount and intensity of rainfall could be held constant, the length of slope constant, and the land use constant by using fallow plats. Detailed descriptions and photographs of the equipment are given. Obviously soil type could not be held constant. With conditions thus regulated, studies from the Northwest Appalachian Soil and Water Conservation Experiment Station at Zanesville, Ohio, are reported on the effect of degree of slope on erosion and run-off. Plats one-hundredth acre in area (72.6 by 6 ft.) were used. The slope varied from 2.9 to 22.5 percent. The steeper slopes are classified as Muskingum silt loam soil, whereas the more gentle sloping ridge tops are classified as Welston silt loam.

Percentage and rate of run-off and infiltration determinations were made under dry and wet soil conditions. No relationship was found between slope and infiltration or between slope and run-off percentage. Run-off percentages under dry soil were quite variable, while with wet soil the run-off percentage was very nearly the same for all slopes. It is also reported that there was no consistent relationship between percentage of run-off and the soil moisture content. The rate of run-off after equilibrium flow was reached was essentially the same for all slopes. The run-off rate during equilibrium flow was rate of rainfall less rate of infiltration.

Soil loss with dry soil from lower slopes assumed a fairly constant rate soon after run-off started. The rate of soil loss followed the rate of water loss rather closely. With slopes of over 9 percent the soil loss varied greatly. Soil losses were considerably lower from the dry soil than under wet soil conditions. The workers explained this difference by a difference in the amount of run-off. Density of run-off did not differ greatly from wet or from dry soil. Soil losses, in general, increased progressively with increased slope under both wet and dry soil conditions. Results on the velocity of run-off as related to slope are to be investigated further. Soil losses exhibited an exponential relationship to velocity of flow.

Soil management for intensive vegetable production on sandy Connecticut Valley land, M. F. MORGAN and H. G. M. JACOBSON (*Connecticut [New Haven] Sta. Bul. 439 (1940), pp. 553-592, figs. 6).*—Ten years' results of intensive soil management in connection with vegetable production in the Connecticut Valley tobacco area on Merrimac sandy loam (deep phase) are presented. The first 3 yr. of the study involved comparisons of concentrated fertilizer materials prepared to contain magnesium and manganese, but no measurable response was obtained from them, as lime applications were necessary before most vegetables could be grown.

Fertilizer, manure, and lime experiments indicated that high yields of miscellaneous vegetable crops can be produced without depleting the soil by a combination of moderate manuring and the application of a medium rate of a complete fertilizer. The presentation of a summary of climatic conditions in relation to yield and fertilizer response for each year is helpful in analyzing the results. In the wetter seasons half-rate fertilizer applications are usually insufficient, and additional fertilizer is relatively more effective than manure for radishes, spinach, and the later planting of lettuce and beets. Manure alone, even at high rate, gives poor results during wet seasons, except for crops that extend their growing season into the warm months. Also, during the periods of heavier rainfall fertilizer of concentrated grade is less effective than normal-strength grade, and high nitrogen treatment (135 lb. of nitrogen per acre) is decidedly superior to the standard rate of 90 lb. per acre except for the later planting of lettuce, for carrots, and for peppers.

For drier seasons, when much less fertilizer is lost by leaching, the following observations were made: (1) Half-rate fertilizer treatment, while less effective than the full-rate, gave proportionately larger yields than in the wetter seasons. (2) The addition of manure to the half-rate treatment is relatively more effective than applying the full-rate fertilizer treatment without manure. (3) Manure alone gave better results than in the wetter years. (4) Fertilizer of concentrated grade gave equally good or better results than the normal-strength grade, except for beets. (5) The high nitrogen treatment was less effective.

Manure applied at the rate of 40 tons per acre, not excessive for vegetable production in Connecticut, caused a considerable increase in the organic-matter content of the soil, while a 20-ton application also tended to increase it. The application of nitrogen to the preceding rye cover crop was quite effective, and there is an indication that this plan tends to give a better distribution of nitrogen availability through the season. Liming acid soils to keep the reaction at from pH 6.2 to 6.6 is deemed necessary in connection with the production of good crops of spinach, lettuce, radishes, beets, carrots, peppers, and lima beans.

Fertilizers supplying from 90 to 135 lb. of nitrogen, from 90 to 135 lb. of phosphoric acid, and from 120 to 180 lb. of potash per acre are deemed desirable for intensive vegetable production on unmanured land. A potato fertilizer experiment on old tobacco land indicated the need of a fertilizer supplying from 80 to 100 lb. of nitrogen, from 40 to 80 lb. of phosphoric acid, and from 120 to 160 lb. of potash per acre. For sweetpotatoes in continuous culture on very sandy soils, a fertilizer is suggested which supplies from 30 to 40 lb. of nitrogen, from 80 to 120 lb. of phosphoric acid, and from 120 to 160 lb. of potash per acre. This fertilizer is most effective as a side dressing. It was found that the organic-matter content of the soil is reduced under intensive vegetable production unless manure or other organic soil amendment is applied to the soil at frequent intervals. A combination of green manuring, winter cover crops, and liberal rates of application of a well-balanced fertilizer is satisfactory for maintaining favorable yields of most vegetable crops.

Salt balance in irrigated areas, C. S. SCOTFIELD. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 1, pp. 17-39, fig. 1).—The relationship of salt input to salt output of an area is designated as the salt balance. If the input exceeds the output the salt balance is regarded as adverse. Results from three related irrigated areas are reported; two are irrigated from the Rio Grande in the vicinity of El Paso, Tex., and the third from the Colorado River in the vicinity of Yuma, Ariz. These areas were studied because of the relatively high concentration of salt in the irrigation waters, averaging approximately 1 ton of dissolved salts to an acre-foot of water, and because of the fact that it was possible to measure the input and output at gaging stations where the water entered and left the areas. As to evaporation losses, consideration must also be given to water entering as rainfall, and the total salt output includes not only the dissolved salts carried away by the drainage and unused irrigation water but also the salts removed by the crops, the quantity that has been removed from solution in the soil, and the quantity that may have decomposed in the soil. The difficulty encountered in determining the extent of these effects in the field is brought out. Studies under controlled conditions are suggested for the investigation of these important factors.

A laboratory experiment was directed toward finding (1) the proportion of the irrigation water that must be allotted to root-zone leaching in order to prevent the accumulation of soluble salts in the root zone, and (2) what proportion of the dissolved salts of the irrigation supply is absorbed by the crop

plant. With minimum salt concentrations of irrigation water of 991 p. p. m. during a 4.5-yr. period, it was necessary to allocate 22.5 percent of the input to root-zone leaching in order to prevent salt accumulation in the soil. In regard to the salts absorbed by the plant, it was found that for alfalfa during the period 13.7 percent of the total salts contained in the input water was so absorbed.

Aspergilli in the soils of Buenos Aires [trans. title], P. NEGRONI and T. NEGRI (*Physia*. 15 (1939), Vo. 47, pp. 193-212, figs. 11; *Eng. abs.*, p. 121).—About half of the 25 compound samples of soils (mostly from gardens) studied failed to reveal *Aspergilli*. Those obtained were *Aspergillus niger*, *A. terreus*, *A. fumigatus*, *A. sulphureus*, *A. flavus-oryzae*, and *A. nidulans*, named in the order of their frequency. A key and discussion of these species are included. There are 24 references.

Commercial fertilizers in 1939-40, G. S. FRAPS, T. L. OGIER, and S. E. ASBURY (*Texas Sta. Bul.* 593 (1940), pp. 47).—The statistics on fertilizers sold in Texas, information regarding the fertilizer law, and analyses of 1,086 samples of fertilizers are reported. The fertilizer grades adopted for Texas are given. Nonacid fertilizers should be used on soils having a pH of 5.5 or lower. However, since most Texas soils are generally only slightly acid, or even alkaline, the use of non-acid-forming fertilizers is not necessary at present. Under neutral or alkaline soils the ordinary fertilizers are preferable to non-acid-forming fertilizers.

Soft phosphate with colloidal clay has an availability to plants on the average of about 40 percent of that of the available phosphoric acid in 20 percent superphosphate. Manganese, magnesia, sulfur, calcium, boron, iodine, zinc, or other secondary fertilizing elements are reported as not being needed as additions to Texas soils at present. Claims for the beneficial action of vitamin B₁ in plant growth had to be revised, pending studies wherein vitamin B₂-response comparisons are made. Plant nutrients were found to cost less per pound in the more concentrated than in the less concentrated fertilizers. Available phosphoric acid cost slightly less in 20 percent superphosphate than it does in 18 percent.

AGRICULTURAL BOTANY

The Badianus manuscript (Codex Barberini, Latin 241), Vatican Library: An Aztec herbal of 1532, E. W. EMMART (Baltimore: Johns Hopkins Press, 1940, pp. XXIV+341, pls. [122], figs. 2).—Originally written by an Indian physician in Aztec and translated by another Indian into Latin, the present translation of this monumental work into English gives a true picture of certain aspects of Aztec medicine at the time of the Conquest. For the botanist, it makes available testimony as to the occurrence of definite plants at a given time in Mexico, and the facsimile color illustrations represent the earliest known plant pictures of American botany. For the pharmacologist and pharmacist, the interest will be largely in the use and preparation of drugs, among which are not only vegetable but also animal and mineral remedies. The foreword is by H. E. Sigerist.

Textbook of botany, E. N. TRANSEAU, H. C. SAMPSON, and L. H. TIFFANY (*New York and London: Harper & Bros.*, [1940], pp. XI+812, pls. 4, figs. 424).—"This textbook of botany represents the authors' ideas of some of the gradual changes in objectives, content, emphasis, sequence, and procedure in general botany that are necessary to incorporate effectively appropriate new discoveries in science and their various applications to human welfare. . . . Material from

all the artificial subdivisions of botany is included, not because we intended to survey the entire field but because the synthesis of material from all phases of botany is necessary to give a student a general perspective of his relations to his plant environment."

[Botanical papers] (*Bosc Res. Inst., Calcutta, Trans.*, 13 (1937-39), pp. 1-254, pls. 2, figs. 17).—The following are included: Proteolytic Enzymes of the Leaves of *Clerodendron infortunatum*, by H. N. Bauerjee (pp. 1-22); Investigation on the Catalase Activity of Jute Seeds (*Olitorius* and *Capsularis*), by A. Guha-Thakurta and B. K. Dutt (pp. 83-92); Catalase Activity of *Cajanus* Seed at Different Stages—Pre-resting, Resting, and Post-resting, by B. K. Dutt and A. Guha-Thakurta (pp. 93-103); Investigation on the Effect of β -Indolyl Acetic Acid on the Longitudinal Growth of Leaves of *Vallisneria spiralis* in Nutrient Solution, by B. K. Palit (pp. 139-157); Polarity of Hormone Transport in the Coleoptile of *Triticum*, by B. K. Dutt and A. Guha-Thakurta (pp. 203-214); and Effect of High Concentration Auxin on the Growth and Geotropism of the Coleoptile (*Triticum*), by A. Guha-Thakurta and B. K. Dutt (pp. 215-254).

Abstracts of dissertations presented by candidates for the degree of Doctor of Philosophy, summer quarter, 1939-40 (*Ohio State Univ., Abs. Doctoral Diss.*, No. 31 (1940), pp. VII+381, pls. 4, figs. 23).—The following are included: A Study of the Mineral Composition of Bluegrass as Influenced by Soil Type and Treatment With Special Reference to Certain Trace Elements, by M. H. McVickar (pp. 195-201); The Effect of Growth Substances on the Absciss Layer in Leaves of *Coleus*, by R. M. Myers (pp. 217-226); and Studies on the Life and Death of Bacteria, by E. A. Steinhaus (pp. 325-331).

Taxonomy and floristics of the Americas (July to December 1939), H. N. MOLDENKE (*Chron. Bot.*, 6 (1940), Nos. 6, pp. 129-131; 7, pp. 154-156).—A list of contributions arranged systematically and including paleobotany, algae, and fungi, as well as bryophytes and higher plants, family or generic names of the plants, and the names of authors. See also previous notes (*E. S. R.*, 81, p. 621; 83, p. 596).

The vegetation of Texas, B. C. THARP (*Houston: Anson Jones Press*, 1939, pp. XVI+74, pls. [2, figs. 17]).—The author of this publication, issued for The Texas Academy of Science, presents brief summaries of the dominant features of each of the 18 major vegetational regions (shown also on a map) and annotated lists of the ferns and flowering plants of the State, based on collections in the herbarium of the University of Texas.

Aquatic vegetation of the Allegheny and Chemung watersheds, R. McVAUGH. (Univ. Ga.). (*N. Y. State Conserv. Dept. Ann. Rpt.*, 27 (1937), Sup., pp. 176-195, fig. 1).—Appended to the text is an annotated list of species which gives the abundance and distribution of the 122 larger aquatic plants found in the area.

An annotated list of Utah grasses, B. F. HARRISON (*Utah Acad. Sci., Arts, and Letters, Proc.*, 16 (1938-39), pp. 23-35).

New and extended ranges for Utah plants, W. P. COTTAM, A. O. GARRETT, and B. F. HARRISON (*Utah Univ. Bul.*, 30 (1940), No. 16, pp. 11).—An annotated list.

Additions to the algae of Oklahoma, C. E. TAFT. (Ohio State Univ.). (*Okl. Acad. Sci. Proc.*, 20 (1940), pp. 49-54).—An annotated list.

Taxonomic relationships in the genus *Gossypium*, S. C. HARLAND (*Jour. Wash. Acad. Sci.*, 30 (1940), No. 10, pp. 426-432).—The author concludes that the Bourbon group is distinct from the upland group on both morphological and genetic grounds, and believes that the assemblage of Bourbons is a good

taxonomic species, which should continue to be known as *G. purpurascens* pending a better name.

A new *Polygonum* from Garfield County, Utah, J. F. BRECKLE and W. P. COTTAM (*Utah Univ. Bul.*, 30 (1940), No. 15, pp. 7, figs. 5).—*P. utahense* n. sp.

New species and new names among Arizona Asteraceae, S. F. BLAKE (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 30 (1940), No. 11, pp. 467-472).

A phytosociological study of the herbaceous plants in two types of forests in central Indiana, J. E. POTZGER and R. C. FRIESNER (*Butler Univ. Bot. Studies*, 4 (1940), Papers 11-14, pp. 163-180).—A study of 9 stands of oak-hickory and 8 of beech-maple. Oak-hickory had 45-50 percent more species than beech-maple. Most species had a low frequency, fidelity, and density percentage, which may have been due to deficient soil moisture in the oak-hickory and to heavy leaf litter and reduced light in the beech-maple stand. The evidence indicates that if classification of forest types be made on the basis of herb layer, Indiana has various types of oak-hickory and beech-maple stands with similar arboreal crown cover. There are 13 references.

Ecology of species of grass and arable lands, V. M. CONWAY (*Chron. Bot.*, 6 (1940), No. 4, pp. 83, 84).—A discussion of recent work on factors changing grassland vegetation.

The effect of overgrazing and erosion upon the biota of the mixed-grass prairie of Oklahoma, C. C. SMITH (*Ecology*, 21 (1940), No. 3, pp. 381-397).—The effects of overgrazing on the plants and animals of this prairie are detailed in the text and in numerous tables and summarized.

Polygonal graphing of ecological data, A. H. HUTCHINSON (*Ecology*, 21 (1940), No. 4, pp. 475-487, figs. 5).—As a result of the detailed study presented (31 references), it is suggested that consideration of polygonal graphing as a method of estimating bioclimatic, bioedaphic, and biotic standards would facilitate the progress of ecology.

Enclosure technique in ecology, R. F. DAUBENMIRE. (Univ. Idaho). *Ecology*, 21 (1940), No. 4, pp. 514, 515).—The author points out a type of fault in technic and emphasizes attention to the problem of minimizing the effect of the barrier on wind movement, insolation, and precipitation. It is recommended that the enclosure be of the largest size and of the lowest, most open structure which can give the desired type of protection.

The interaction of higher plants and soil micro-organisms.—I, Microbial population of rhizosphere of seedlings of certain cultivated plants, M. I. TIMONIN. (N. J. Expt. Stas. et al.). (*Canad. Jour. Res.*, 18 (1940), No. 7, Sect. C, pp. 307-317, figs. 3).—"The microbial population in the rhizosphere of wheat, oats, alfalfa, and peas was studied, and the relative abundance of different types of micro-organisms recorded. By means of the plating method it was found that bacteria and actinomycetes were 7 to 71 times greater in the rhizosphere than in the soil distant from the roots, whereas fungi were but 0.75 to 2.1 times more numerous. Different varieties of plants affected the activity of the various groups of soil micro-organisms differently. Thus fungi were more numerous in the rhizosphere of oats, and bacteria in the rhizosphere of alfalfa. Seventeen genera of fungi were represented in isolates from the rhizosphere of seedlings and the soil distant from the roots. However, no marked difference was observed in the types isolated from the rhizosphere of different varieties of seedlings." A fungus isolated from the rhizosphere of alfalfa proved to be *Spicaria terrestris* n. sp., and the genus *Spicularia* Persoon was amended to include it.

Response of the peanut plant to inoculation with Rhizobia, with special reference to morphological development of the nodules, O. N. and E. K

ALLEN. (Univ. Hawaii). (*Bot. Gaz.*, 102 (1940), No. 1, pp. 121-142, figs. 11).—Each of 59 *Rhizobium* strains from various legumes proved infective to peanut roots, 17 strains markedly enhancing growth, 9 being effective to a less extent, and 33 proving decidedly nonbeneficial. All nodules were located in the root axils, those produced by the ineffectual strains being inconspicuous. Abnormal nodose formations, proving to be hypertrophied parenchymatous tissue containing heavy deposits of starch, were frequent at the rootlet bases of nitrogen-deficient plants. Root infection resulted from invasion through ruptured tissue at the site of lateral root emergence. No data were obtained supporting root hairs as avenues of infection. The origin of the nodule was in the pericycllic cells adjacent and in juxtaposition to the protoxylem strand from which the rootlet had emerged. Dissemination of the *Rhizobia* throughout the bacteroid area was effected by passive transmission to new cells during the laying down of the cell plate. Differentiation of the nodule resulted from the formation of a peripheral meristem serving in the production of a nodule cortex and a bacteroid area. A branched vascular system supplying the nodule surrounded the bacteroid area and connected the xylem and phloem of the main root through a single connecting strand at the base of the nodule. Spherical plastid-like bodies, identified as aleurone grains, were abundant in the infected cells of the bacteroid area. It is believed that aleurone is directly connected with the symbiosis, and is significant in the nitrogen-fixation process. Initial stages in nodule degeneration were characterized by the formation of a suberized layer of cells at the base of the nodule, thereby cutting off the vascular supply. Consequently, the bacteroid area assumed a slimy consistency and *Rhizobia* invaded the intercellular spaces. The bacteroid area of many nodules was absorbed by the plant prior to collapse of the old nodule cortex. There are 42 literature citations.

Studies on soybean nodule bacteria (*Rhizobium* sp.), I, J. A. AGATI and E. H. GARCIA (*Philippine Jour. Agr.*, 11 (1940), No. 1-3, pp. 271-283, pls. 3).—Although each of the seven isolates obtained was capable of producing nodules, only three proved desirable from the standpoints of both nodulation and nitrogen fixation.

Liebig and the organic nutrition of plants, II, R. KRAYBILL. (Ind. Expt. Sta.). (*Amer. Fert.*, 93 (1940), No. 6, p. 6).—An abstract.

The physiology of cell elongation, A. N. J. HEYN (*Bot. Rev.*, 6 (1940), No. 10, pp. 515-574).—A monographic review (162 references) on the plant cell, including considerable space devoted to the author's own work.

New research on growth and tropisms, H. G. DU BUY. (Univ. Md.). (*Chron. Bot.*, 6 (1940), No. 4, pp. 80-83).—A summary of recent work (about 50 references) on plant growth regulators, their origin, physical and chemical properties, translocation, mode of action, histological and cytological effects, and practical applications.

The effect of light, gravity, and centrifugal force on buckwheat seedlings, J. M. SMITH (*Okl. Acad. Sci. Proc.*, 19 (1939), pp. 65-67).—A brief summary of experimental results, with the conclusion that plants respond to these physical forces with a considerable degree of accuracy.

The relation between frost resistance and the physical state of protoplasm.—I, The protoplasm as a whole, J. LEVITT and D. SIMINOVITCH (*Canad. Jour. Res.*, 18 (1940), No. 11, *Sci. C*, pp. 550-561, pl. 1, fig. 1).—"The protoplasm of hardy and nonhardy cells was compared with regard to displacement by centrifuging, rounding-up time on plasmolysis, deplasmolysis injury, rate of Brownian movement, resistance to and recovery from distortion by micromanipulation. The conclusions are: (1) When the cells are in the normally hydrated (i. e.,

turgid) condition, there is either no difference in the consistency of hardy and nonhardy protoplasm, or else it is slightly less in the latter; (2) when the cells are plasmolyzed to the same degree (i. e., with a weaker plasmolyte in the case of the nonhardy), there is no difference in consistency; (3) when the cells are in equilibrium with one and the same concentration of plasmolyte, the protoplasmal consistency of the nonhardy is greater than that of the hardy; (4) the nonhardy are more susceptible to mechanical injury."

A form of low-temperature injury in detached leaves, E. R. ROUX (*Neur. Phytol.*, 39 (1940), No. 3, pp. 271-276, figs. 2).—The author describes a form of borrowing following exposure to temperatures above the freezing point of the cell sap in detached leaves of evergreen loquat, *Viburnum* sp., and *Ficus* sp. Leaves picked in summer were not susceptible, and leaves otherwise susceptible were protected by previous exposure for a few days to a higher temperature before placing in cold storage. Attempts to relate this susceptibility to low-temperature injury in winter leaves to air temperatures, humidities, and light intensities at time of picking were unsuccessful.

Effect of sulphur dioxide on vegetation, M. KATZ (*Chron. Bot.*, 6 (1940), No. 6, pp. 131, 132).—A rather extensive digest of the contents of the book already noted (E. S. R., 81, p. 769).

Injection for the diagnosis of mineral deficiencies in the tomato, the potato, and the broad bean, H. HILL and W. A. ROACH (*Ann. Bot. [London]*, n. ser., 4 (1940), No. 15, pp. 505-521, pls. 3, figs. 6).—The authors studied the distribution following injection of an aqueous solution of acid fuchsin into an interveinal area of a leaf blade, the leaf tip, and the leaf stalk of the three plant species grown in sand culture deficient in one or more of the elements N, P, K, Ca, Mg, and B and injected with solutions containing the deficient element. The plants responded to all the elements injected, and the regions responding to the nutrient injections were similar to those colored by the dye. The response was general or local according to the injection method used. The distribution of the injected liquids could be explained by the arrangement of the vascular system. The methods described enable diagnosis of deficiencies to be made in 7-21 days and provide means of rapidly and without injury making good any deficiency to which the plant has been subjected.

Mineral nutrients in relation to flower development, W. F. LOEWING (*Science*, 92 (1940), No. 2397, pp. 517-520).—A review of recent research on mobilization of materials and other phenomena associated with reproduction.

The role of potassium in plants, M. E. WALL. (N. J. Expt. Stas.). (*Chron. Bot.*, 6 (1940), No. 6, p. 133).—A discussion of recent findings and suggestions for future research (E. S. R., 83, p. 598).

Boron absorption by sunflower seedlings, C. S. SCOTFIELD, L. V. WILCOX, and G. Y. BLAIR. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 1, pp. 41-56, figs. 5).—Seedlings of *Helianthus annuus* were grown for 6 weeks in culture solutions differing only in B content. Without B or special purification of reagents growth was arrested before the first leaves had fully developed, but in solutions containing 0.05-2.5 p. p. m. of B growth was normal. The B content of the leaves increased progressively with its content in the culture solution. It is suggested that sunflower seedlings may be grown in samples of soil and the leaves analyzed for B as a means of estimating the available B content of the soil in cases of suspected deficiency. The new word "mitrophic" is proposed to describe such elements as B, Mn, Fe, and Zn, which are essential to plant growth in lesser quantities than such elements as N, K, and P.

The effect of ringing and of transpiration on mineral uptake, E. PHILLIS and T. G. MASON (*Ann. Bot. [London]*, n. ser., 4 (1940), No. 15, pp. 645-650).—

Removal of a ring of bark of sea-island cotton between the foliage region and the root depressed the uptake of Br by the root within a period of a little over 2 hr. after ringing. The wood alone in the ringed plants transmitted as much Br up the stem as the bark and wood together in the normal plants. Increased transpiration caused increased uptake of Br in ringed plants, and a greater proportion of the absorbed Br was carried into the aerial parts of the plant under high transpiration than under low. It is believed the transpiration affects mineral uptake by altering the concentration in the absorbing region of the root and possibly also by oxygenating the root, while assimilation affects uptake by altering the solvent capacity of the root.

The effect of ringing on the upward movement of solutes from the root, E. PHILLIS and T. G. MASON (*Ann. Bot. [London], n. ser., 4 (1940), No. 15, pp. 635-644, figs. 4*).—Sea-island cotton plants consisting of two branches, a short main stem, and a root were used, in one group both branches being left intact and in a second group one branch being ringed. Ringing of one branch caused a small reduction in uptake of Ca and P by the whole plant. The ringed branch contained more P and less Ca than the normal branch of the ringed group and also more P and less Ca than the branches of the normal plant. It is concluded that the results harmonize with the view that the bulk of the soil solutes ascend the stem in the wood and, provided they are mobile in the phloem, are reexported down the stem in the phloem. It is suggested that the discrepancy between the results here described and those of Curtis (*E. S. R., 52, p. 125*) is due to the fact that the ringed branches in the latter case had to compete for water with a number of unringed branches, while in the present study the ringed branch had only one unringed branch with which to compete.

An observation of the effectiveness of root pressure in the ascent of sap, R. C. FRIEDSNER (*Butler Univ. Bot. Studies, 4 (1940), Papers 15-18, pp. 226, 227*).—A note on "bleeding" through bark unbroken save by the force of the exudate itself on sprouts of *Acer rubrum* from stumps made 4 yr. previously.

Investigations on the significance of ethereal oils in regulating leaf temperatures and transpiration rates, L. J. AUDUS and A. H. CHEETHAM (*Ann. Bot. [London], n. ser., 4 (1940), No. 15, pp. 465-483, figs. 12*).—Theoretical considerations indicated that vapor screens of ethereal oils around leaves can absorb at most less than 1 percent of the total incident heat radiations. Comparison of leaf temperatures of cherry laurel on irradiation through 15-in. screens of pure dry air and of air saturated with the vapors of anise, rosemary, thyme, verbena, peppermint, lemon, eucalyptus, and lavender oils indicated that differences between leaf and air temperatures tend to increase in the presence of vapor screens, presumably due to transpiration depression arising from the toxic effects of the vapors. Exposure of shoots to 1.5-cm. screens of air saturated with vapors of rosemary, thyme, and anise oils in both high and low light intensities failed to produce measurable effects on transpiration rate, leaf temperature, or stomatal resistance. Studies on the rates of evaporation of oils from filter paper and the associated cooling effects demonstrated that the latter are too small to have ecological significance. It is concluded that, in plants producing them, ethereal oils play no role in regulating water loss or leaf temperatures.

Nitrogen metabolism of the plant embryo, W. L. McRARY (*Bot. Gaz., 102 (1940), No. 1, pp. 89-96, figs. 4*).—Protein disappearing from the lupine cotyledon was found to accumulate in the axis as amino acids and amides. Plants grown in darkness hydrolyzed more protein and transported the products to the axis sooner than plants grown in the light. Longitudinal plant growth may occur to a marked extent with little or no change in the actual protein content of the part affected. The amino and amide nitrogen concentrations in the water of the

tissues remained at the same order of magnitude throughout the first 15 days of germination, suggesting a dynamic relation between these two nitrogen fractions and protein hydrolysis.

Pectic substance of cotton fibres in relation to growth, R. L. WHISTLER, A. R. MARTIN, and C. M. CONRAD. (U. S. D. A. et al.). (*Textile Res.*, 10 (1940), No. 11, pp. 449-452, fig. 1).—Determination of the content of pectic substance at various growth periods suggested three distinct developmental stages of the cotton fiber. The first extended to about the eighteenth day and was characterized by a gradual decrease in pectic substance, the second extended to about the thirty-fifth day, during which time there was rapid decrease in pectic material, while the third extended to maturity, with only a slight decrease in pectic content. These three stages are said to agree well with the conclusions of other investigators from different types of data.

The formation of pyruvic acid in barley respiration, G. M. and W. O. JAMES (*New Phytol.*, 39 (1940), No. 3, pp. 266-270).—"Barley roots poisoned with 0.01-0.1 percent acetaldehyde or 0.3 percent solutions of certain aromatic sulfonic acids developed an ammonia-nitroprusside reaction for pyruvic acid which is not given by normal roots. Pure pyruvic acid was isolated as the 2,4-dinitrophenylhydrazone from cut and darkened leaves poisoned with 0.2 percent 1-naphthol-2-sulfonic acid. Since these poisons inactivate carboxylase, the above results suggest that pyruvic acid is continuously formed by barley tissues and is normally decarboxylated. Further evidence is thus provided for regarding it as an intermediate product in barley respiration."

Effect of phytohormone dust seed treatment on growth and yield of barley under greenhouse conditions, J. W. HOPKINS (*Canad. Jour. Res.*, 18 (1940), No. 10, Sect. C, pp. 507-512).—"Under controlled conditions of air temperature and soil moisture, the growth and yield of barley from seed dusted with 2.5 and 5 p. p. m. of indolylacetic acid in talc was compared with that from control seed dusted with talc only. Neither concentration affected germination. Both accelerated the incidence of tillering by 1 or 2 days, but did not increase the final number of shoots produced. With suboptimal soil moisture both phytohormone concentrations increased the height of the plants by about 3 percent and the dry weight of straw by about 10 percent, but did not increase the yield of grain. No demonstrable effect upon the yield of either straw or grain was observed in a parallel series of plants receiving a more plentiful supply of moisture."

Effects of vitamin B₁ upon the development of some flowering plants, C. L. HAMNER (*Bot. Gaz.*, 102 (1940), No. 1, pp. 156-168, figs. 4).—Vitamin B₁ was added to a number of different plants at 0.01 mg. per liter. No visible differences were detected between the control plants and those receiving B₁, and no significant difference was obtained in wet weight or in the accumulation of dry matter. Under neither a long nor a short photoperiod, nor at high or low planes of nitrogen nutrition, were there detectable differences ascribable to additions of vitamin B₁ to the cultures. Vitamin B₁ had no effect in hastening flowering, on size or number of flowers produced, or on color or quality of flowers in cosmos. Statistically, the differences which could be ascribed to the addition of B₁ as compared with controls under similar environment were never significant.

Chemical and histological responses of bean plants grown at different levels of nutrition to indoleacetic acid, O. SMITH, L. B. NASH, and G. E. DAVIS (Cornell Univ.). (*Bot. Gaz.*, 102 (1940), No. 1, pp. 206-216, figs. 11).—One lot of kidney bean seedlings was grown under conditions of high nitrogen and low carbohydrate, and another lot under the reverse conditions. Treatment

with indoleacetic acid greatly increased the rate of root formation in the low-nitrogen, high-carbohydrate seedlings, but the response of the other lot was much slower. Apparently the carbohydrates were the limiting factor in the production of new roots after treating the high-nitrogen, low-carbohydrate seedlings with the acid. The high-nitrogen, low-carbohydrate seedlings were less responsive to changes in distribution of dry weight, probably due to the low-carbohydrate supply for transport to the treated region. In general, treatment with the acid was accompanied by greater nitrogen transfer from the upper to the lower parts of the seedlings. Nitrogen movement following treatment was greater from leaves to roots and lower hypocotyl in the high-nitrogen, low-carbohydrate seedlings. Treatment decreased the percentage of total sugars in all parts, and the percentage at both levels of nutrition was still lower at the end of the experiment than in those seedlings not treated with the acid. In general, the percentage of alcohol-insoluble acid-hydrolyzable carbohydrates increased in the hypocotyl and to a lesser extent in the leaves with the age of the seedling and to a greater extent in untreated than in treated plants. The percentage of hydrolyzable carbohydrates in the first internode of untreated seedlings was about the same at the end of the experiment as at the beginning, whereas internodes of treated seedlings decreased in this constituent.

The effect of beta-indole-acetic acid upon isolated plant embryos, M. S. GARDINER (*Mount Desert Isl. Biol. Lab. Bul.*, 1940, pp. 22, 23).—An abstract of studies on *Phaseolus* spp.

Effects of dusts containing indolylbutyric acid and oestrone on the rooting of dormant *Lonicera tartarica* cuttings, N. H. GRACE (*Canad. Jour. Res.*, 18 (1940), No. 7, Sect. C, pp. 283-288).—"Indolylbutyric acid and oestrone, separately and in combination in a series of talc dusts, were applied to dormant cuttings of *L. tartarica*. Indolylbutyric acid treatment, averaged over all oestrone treatments, increased the number of cuttings rooted, the number and length of roots per rooted cutting, the mean root length, and the green weight of leaf produced by the dormant cuttings. The average effect of oestrone on these responses was depressive throughout. Oestrone tended to offset the beneficial effects of the plant growth stimulating chemical, excepting the combination of 100 p. p. m. of each which increased root length. Oestrone alone did not reduce either the number or lengths of root per rooted cutting. The results indicated that the number and length of roots and the green weight of leaf produced are more sensitive responses for demonstrating differences due to indolylbutyric acid concentration in talc than is the percentage of cuttings rooted."

Starch hydrolysis in bean leaves following spraying with alpha naphthalene acetic acid emulsion, J. W. MITCHELL, E. J. KRAUS, and M. R. WHITEHEAD. (U. S. D. A.). (*Bot. Gaz.*, 102 (1940), No. 1, pp. 97-104, figs. 4).—A 1-percent lanolin and water emulsion of the growth substance was sprayed on the upper surfaces of attached bean leaves, and the starch digestion and sugar accumulation under darkness or low light intensity and the rate of starch and sugar accumulation under illumination were studied by quantitative determinations made at intervals after treatment. The percentage of starch and dextrin in treated leaves placed in darkness decreased more rapidly than in control leaves, but noticeable differences were not apparent for several hours. The percentage of sugar in leaves sprayed and placed in darkness increased during that period following treatment when starch digestion was most rapid, but later decreased as the starch reserve was depleted, finally reaching a value about equal to that of control leaves. Leaves depleted of starch, sugars, and

dextrin by holding in darkness and subsequently spraying with the growth substance and then placed in daylight accumulated less sugar, starch, and dextrin during the period of illumination than did comparable untreated leaves.

The role of growth substances in the regeneration of root cuttings. W. PLANT (*Ann. Bot. [London]*, n. ser., 4 (1940), No. 15, pp. 607-615, pl. 1).—In root cuttings (thongs) of sea-kale (*Crambe maritima*) a growth substance was indicated by the *Arena* test. When thongs were treated with α -naphthaleneacetic acid (0.02 percent) roots were produced all along the thong. Repeated decapitation of apex and base eventually resulted in bud production at the base, and from these buds thongs with buds at both ends were produced. When thongs with buds induced basally by decapitation were then treated with β -indolylacetic acid (0.01 percent), roots were subsequently produced at the apex. When the vegetative growth of an "inverted" thong after 5 mo. is compared with a normal "control" thong, morphological differences are observed. Root systems arising from the mass of callus tissue or from the base of the parent thong showed secondary thickening, whereas apically induced root systems of the inverted thongs did not. Normal thongs had subsidiary roots, showing thickening, arising from the basal end only. It is concluded that the differentiation and behavior of the meristematic tissue is determined, in part, by specific concentrations of growth substance, relatively high and low concentrations influencing root and bud production, respectively.

Heteroauxin and the growth of meristems of Brassica. H. W. HOWARD (*Ann. Bot. [London]*, n. ser., 4 (1940), No. 15, pp. 589-594, figs. 5).—The author's previous report¹ that a leaf initial had been converted into a root meristem by heteroauxin action he believes to be wrong, the true explanation apparently being that an extra external meristem had been formed in the cotyledon axil above the axillary bud and that this meristem had grown into a root. The problem of the two types of plant meristems is discussed, and it is concluded that root anlagen are formed where the concentration of auxin is high and that shoot anlagen are formed where it is relatively low.

Peptidase activity in the Avena coleoptile phytohormone test object. G. S. AVEEY, JR., and K. LINDERSTROM-LANG (*Bot. Gaz.*, 102 (1940), No. 1, pp. 50-63, figs. 9).—*Arena* seedlings were grown in darkness at 25° C. on moist filter paper in preparation dishes. When the coleoptiles were 1.5, 4, 10, 17, and 36 mm. long, they were uniformly sectioned at 125 μ or 250 μ and peptidase determinations made on these segments. On a per segment basis, peptidase activity, reduced weight, and cell number were found to decrease in progressively older coleoptiles. For any given coleoptile 4 mm. or more in length, enzyme activity per unit weight or per cell was consistently greater at the tip. Correlations between morphology and auxin and peptidase gradients in the coleoptile are pointed out.

Oxidase systems in the tissues of the higher plants. J. G. BOSWELL and G. C. WHITING (*New Phytol.*, 39 (1940), No. 3, pp. 241-265).—A comprehensive review (89 references).

Sexual substances in the algae. K. V. THIMANN (*Chron. Bot.*, 6 (1940), No. 2, pp. 31, 32).—A review of recent advances.

Checking and adjusting the alignment of objectives in the binocular dissecting microscope. C. O. HATHAWAY and F. F. FERGUSON (*Stain Technol.*, 15 (1940), No. 4, pp. 173, 174).

Combined fixing, staining, and mounting media. C. ZIEKLE (*Stain Technol.*, 15 (1940), No. 4, pp. 139-153).—A number of nonvolatile, water-soluble substances can be added to the usual acetocarmine fixing fluids which do not alter

¹ Ann. Bot. [London], n. ser., 2 (1938), No. 8, pp. 933-942, figs. 12.

the fixation image and serve as mounting media when the volatile ingredients have evaporated. Formulas are given for solutions containing dextrin, dextrose, gelatin, pectin, sorbitol, and sucrose. Gum arabic can be incorporated in a formic acid-carmine fixative. The limiting factor in such media in fixing fluids is the osmotic value they give to the solution, but with certain precautions they can replace the usual acetocarmine treatment. Some of the natural balsams can also be incorporated in fixing fluids. Formulas are given for fixatives containing Venetian turpentine, sandarac, Canada balsam, and two synthetic resins. Addition of carmine to the fluids enables one to fix, stain, dehydrate, clear, and mount in one operation. Detailed procedures are presented, with 19 references.

Resins for sealing glycerin mounts, with a note on the use of Clarite (Nevillite V), J. L. MOHR and W. WEHLE (Univ. Calif.). (*Stain Technol.*, 15 (1940), No. 4, pp. 174, 175).

The acetocarmine method for fruit material, P. T. THOMAS (*Stain Technol.*, 15 (1940), No. 4, pp. 167-172, figs. 5).—The difficulty of making good acetocarmine preparations of plants with small chromosomes at meiosis is noted. The staining reaction depends on the composition of the prefixative, duration of fixation, strength of acetocarmine, and amount of iron used. Detailed procedures are presented, and suitable combinations of these factors for some fruit plants are described.

Preventing the curling of wood sections, F. HYLAND (Univ. Maine). (*Yale Univ. School Forestry, Trop. Woods*, No. 64 (1940), pp. 41-43).—The tendency of wood sections to curl while being passed through the higher alcohols was obviated by placing them between fine wire screens, those made of stainless steel, Monel metal, and aluminum being found to withstand corrosion.

Notes on the technique of tree-ring analysis, I, A. E. DOUGLASS (*Tree-Ring Bul.*, 7 (1940), No. 1, pp. 2-8).

A container for growing plants for root studies, N. L. PARTRIDGE (Mich. State Col.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 11, pp. 907, 908, figs. 2).—The galvanized iron containers described were 10 by 10 in. and 4 ft. deep, with one side detachable. Successful use in studying the relative depth to which certain grasses would root is reported.

A rapid method for excavating root systems of native plants, B. C. THARP and C. H. MULLER (U. S. D. A. et al.). (*Ecology*, 21 (1940), No. 3, pp. 347-350, figs. 2).—In the "bisect-wash" method described in detail, a smooth face of soil is cut through the plant axis vertically to a depth and breadth to insure inclusion of all roots in the plane of bisection. Horizontal and perpendicular lines are marked off by a cord on this face, and by a jet of water the soil is removed from the whole face of the bisection to a depth of 1-2 in. A second bisection at right angles to the first provides a check on the first to insure a representative sample of the entire root system.

Methods for growing pollen tubes for physiological and cytological studies, O. J. EIGSTI (*Okla. Acad. Sci. Proc.*, 20 (1940), pp. 45-47, figs. 5).—The construction of a chamber for growing pollen tubes is described and the general procedure for its use outlined.

The morphology of pollen tubes in angiosperms, O. J. EIGSTI (*Okla. Acad. Sci. Proc.*, 19 (1939), pp. 105-108, fig. 1).—Twenty species of plants were studied, and the results are briefly summarized.

Comparative histogenesis of vegetative and floral apices in *Amygdalus communis*, with special reference to the carpel, R. M. BROOKS (*Hilgardia [California Sta.]*, 13 (1940), No. 5, pp. 249-306, pls. 4, figs. 11).—The marked histogenic differences found between leaf and flower buds in the almond apparently shed light on the general problem of carpel morphology in angiosperms.

and fail to support the classical interpretation that the carpel is homologous with a foliage leaf. The results of this anatomical and developmental study are discussed in detail, and it is concluded that from a developmental standpoint the carpel is a distinct and unique organ among living angiospermous plants. Broad comparative histogenic studies are deemed urgent in order to test this interpretation. Over six pages of references are given.

Structure of end walls in differentiating vessels, K. ESAU and W. B. HEWITT (*Hilgardia* [California Sta.], 13 (1940), No. 5, pp. 229-244, pls. 4).—The differentiating vessel elements of the herbaceous angiosperms here considered (pumpkin, corn, tobacco, carrot, and beet) showed intact end walls until the future vessel reached its final diameter and developed secondary lignified layers on the longitudinal walls. Two superposed vessel elements were separated from each other by two cellulose layers—the two primary walls—cemented together by isotropic intercellular substance. There are 31 references.

Developmental anatomy of the fleshy storage organ of *Daucus carota*, K. ESAU (*Hilgardia* [California Sta.], 13 (1940), No. 5, pp. 175-226, pls. 14, figs. 12).—This study of the edible tap root of the carrot plant describes, in different stages of development, the tissues making up this organ and interprets its gross morphological features in terms of histological details. There are 38 references.

Anatomy of the vegetative parts of manihot [trans. title], A. P. VIGAS (*Inst. Agron. Estado* [São Paulo], Campinas, Bol. Téc. 74 (1940), pp. 30+[1], pls. 39).

Microbes in a changing world, S. A. WAKSMAN. (N. J. Expt. Stas.). (*Sci. Mo.*, 51 (1940), No. 5, pp. 422-427).—A general review of progress in the study of bacteria.

Proceedings of local branches of the Society of American Bacteriologists (*Jour. Bact.*, 40 (1940), No. 1, pp. 143-169).—Abstracts of the following papers of interest to botany are included: Bacterial-Fungus Antagonisms, by C. L. Porter (p. 144) (Purdue Univ.); The Implications of Variability on the Species Concept in Bacteriology, by R. E. Buchanan (p. 153), The Morphology and Physiology of Certain Myxobacteria of Iowa, by J. M. Beebe (pp. 155, 156), The Relationship of CO₂ Utilization to Succinic Acid Formation by the Coliform Bacteria, by H. G. Wood and C. H. Werkman (p. 158), and The Stimulative Effect of Glucose on the Anaerobic Dissimilation of Citrate by *Streptococcus parvityrosus*, by H. D. Slade and C. H. Werkman (p. 158) (all Iowa Expt. Sta.); The Influence of Mineral Fertilizers on Symbiotic Nitrogen Fixation, by J. L. Roberts and F. R. Olson (p. 154) (Ind. Sta.); Percentage Utilization of Substrates by the Root Nodule Bacteria, by R. H. Burris and P. W. Wilson (pp. 154, 155), and The Respiration of *Lactobacillus bulgaricus* Near Its Maximum Growth Temperature, by R. M. Stern and W. C. Frazier (pp. 158, 159) (both Univ. Wis.); Bacteriology in the Paper Industry, by F. W. Tanner (p. 153) (Univ. Ill.); Formation of Acetylmethylcarbinol by Cell-Free Juices [from *Acrobacter aerogenes*], by M. Silverman and C. H. Werkman (p. 156), and Cellulose Decomposition by Some Aerobic Organisms, by A. G. Norman and W. V. Bartholomew (p. 158) (both Iowa State Col.); and A Wide-Range H-ion Indicator Produced by an *Actinomyces* Species, by J. E. and H. J. Conn (p. 168).

Cation adsorption by bacteria, T. M. McCALLA. (Kans. Expt. Sta.). (*Jour. Bact.*, 40 (1940), No. 1, pp. 23-32).—*Escherichia coli* adsorbed cations, and the magnitude of this ability was demonstrated by four methods and measured. Other bacteria were also shown to adsorb cations, and a proposed mechanism is advanced. The adsorbed cations are exchangeable.

GENETICS

Gene and chromosome theory and cytology at the Seventh International Genetical Congress, Edinburgh, 1939, D. G. CATCHELSE (Chron. Bot., 6 (1940), No. 1, pp. 9-11).—A review of contributions to the congress.

Influence of female stock on the functioning of small pollen male gametes, W. R. SINGLETON. (Conn. [New Haven] Expt. Sta.). (Natl. Acad. Sci. Proc., 26 (1940), No. 2, pp. 102-104).—Although earlier studies showed that when corn plants heterozygous for small pollen-1 sp_1 served as the male parent in crosses less than 1 percent of the sp_1 pollen grains usually functioned, when the sweet corn stocks Purdue 39 and Connecticut 81 received pollen of the constitution $sp_{18u} Sp_{18u}$ 39 and 17 percent, respectively, of the resulting kernels were su . Only about 6 percent (the cross-over ratio between sp_1 and su) would be expected if only Sp_{18u} grains had functioned. A considerable functioning of sp_1 pollen grains in competition with normal was shown. See also a note by Mangelsdorf (E. S. R., 67, p. 225).

Translocations in maize involving chromosome 3, E. G. ANDERSON and R. A. BRINK. (Univ. Wis. et al.). (Genetics, 25 (1940), No. 3, pp. 299-309).—The 21 translocations in corn involving chromosome 3, for which data are reported, are distributed from the neighborhood of d_1 , well out on the short arm, almost to a_1 in the distal part of the long arm.

Genetical studies in cultivated raspberries.—I, Inheritance and linkage, D. LEWIS (Jour. Genet., 38 (1939), Nos. 1-2, pp. 367-379, pl. 1).—Continuing the work of Crane and Lawrence (E. S. R., 66, p. 435), the author describes five new genes— s , b , x , y , and d —controlling the following morphological characters: Spineless shoots, shoots without waxy bloom, red hypocotyl, pale-green leaf, and sepaloid flowers, respectively. In addition, he presents statistical analyses of all gene segregations and describes one linkage group of four genes.

Genetical studies in cultivated raspberries.—II, Selective fertilization, D. LEWIS (Genetics, 25 (1940), No. 3, pp. 278-286, fig. 1).—Continuing the series referred to above, the author describes a gene, w , causing differential fertilization in the cultivated raspberry and aberrant ratios and heterogeneity in linked marker genes T and G when the particular genes are segregating on the male side. The action of the pollen tube gene w is to inhibit completely or to retard pollen tube growth at some stage between pollen germination and fertilization. Cross-over values between W and the marker genes T and G are calculated, and a chromosome map with five genes is given.

Research on twins and animal breeding, F. A. E. CREW (18. Internatl. Cong. Agr., Dresden, 1939, Sect. 9. Main Rpts., pp. 15-21).—A review of the occurrence of twinning in farm animals.

Methods of securing blood from rats, as developed in a study of blood groups and their inheritance, S. O. BURHOE (Univ. Md.). (Jour. Hered., 31 (1940), No. 10, pp. 445-448, fig. 1).—Securing blood in a sterile condition from etherized rats by clipping the tail or, more satisfactorily, by a cardiac puncture is noted.

The inheritance of resistance, demonstrated by the development of a strain of mice resistant to experimental inoculation with a bacterial endotoxin, A. BRADFORD HILL, J. M. HATSWELL, and W. W. C. TOPLEY (Jour. Hyg. [London], 40 (1940), No. 5, pp. 538-547).—The resistance of mice was increased by 10 generations of selective breeding from the progeny of animals treated with a standard dose of 4 mg. of a bacterin of *Bacterium typhi-murium* (= *B. aertrycke*). In the fourth generation 36 percent of the survivors of treated ancestors survived. In the ninth and tenth generations 64 percent of the

selected stock survived, as compared with only 14 percent of the controls from nontreated parents. In the ninth and tenth generations a few animals from parents resistant to the toxin showed less than normal resistance to a living culture.

The inheritance of a tail abnormality in the house mouse, E. CASPARI and P. R. DAVID (*Jour. Hered.*, 31 (1940), No. 10, pp. 427-431, figs. 2).—A kink character involving a tail flexure in the house mouse was found to be inherited as a dominant, with the homozygote lethal. Inbred kinks crossed with normals produced about 50 percent showing the abnormality. Inter se matings of kinks (heterozygous) produced a 2:1 ratio in the progeny. A pure kink strain could not be established by inbreeding. The size of F_2 litters was reduced and there was a slight excess of normals, suggesting the possibility of a lowered viability of heterozygotes or the apparent failure of the kink character to show in some heterozygotes. Similarity of the character with fused (E. S. R., 77, p. 608) is noted but seems questionable.

Hereditary hypotrichosis in the rat (*Mus norvegicus*), E. ROBERTS, J. H. QUISENBERRY and L. C. THOMAS. (Univ. Ill.). (*Jour. Invest. Dermatol.*, 3 (1940), No. 1, pp. 1-29, figs. 16).—Continuing earlier studies by the Illinois Experiment Station (E. S. R., 60, p. 217), in which hypotrichosis in the rat was shown to be due to an autosomal recessive gene, the authors state that the total combined data indicate the production of 1,335 haired and 440 hairless young as the progeny of heterozygous animals. In reciprocal backcrosses there were 731 haired and 722 hairless, confirming the hypothesis as to the mode of inheritance of the character. Hypotrichosis was not linked with nonagouti, hooded, red eye, dilution, color, or curly characters for which suitable linkage tests were conducted. In further studies of the effects of the gene on mortality, weight, and vigor it was indicated that the length of life, growth rate, and fertility of hairless individuals were reduced as compared with normals. The basal metabolism was not significantly different. From skin transplantation experiments it was judged that the cause of hairlessness lies in the skin. No histological structure differences were noted in the pancreas, thyroids and adrenals, and spleen; and pituitary weights were similar.

Breeding small flocks of domestic fowl for high fecundity, F. A. HAYS. (Mass. Expt. Sta.). (*Poultry Sci.*, 19 (1940), No. 6, pp. 380-384).—Two lines of Rhode Island Reds from a common source were selectively bred for eight generations—one for plumage characters and the other for characters essential for high fecundity. Generally, less than 30 birds in each line completed the first year's production. These results were rather irregular, pointing toward the conclusion that selective breeding in such small flocks is not effective in establishing or maintaining characters associated with high egg production.

Breast ridge in domestic fowl, a new dominant character linked with pea comb, or another expression of the pea comb gene? S. S. MUNRO and L. L. KOSIN (*Amer. Nat.*, 74 (1940), No. 753, pp. 382-384).—A character designated as "breast ridge" consisted of a longitudinal formation running along the breast in the skin of Cornish and Cornish crossbred fowls. This character was found in crosses and in F_2 s between Cornish and Barred Plymouth Rock, White Leghorn, and Light Sussex fowls to behave as a dominant non-sex-linked character. In backcrosses there were produced 72 ridged to 67 nonridged progeny. Among 190 F_2 backcross progeny there were only 3 pea-combed individuals without the condition. Because of some variation in the character, and since the exceptions were at young ages, crossing over did not seem the probable explanation.

Note on the inheritance of yellow bill colour in ducks, J. M. RENDEL (*Jour. Genet.*, 40 (1940), No. 3, pp. 439, 440).—In the progeny from 13 matings, which

included some progeny with bright orange-yellow bills, there were 210 ducklings with normal bills and 66 with orange-yellow bills. This was thus an approximate 3:1 ratio in progeny from heterozygotes, assuming yellow bills to be caused by an autosomal, recessive gene.

Albinism in mockingbirds, E. A. McILHENNY (*Jour. Hered.*, 31 (1940), No. 10, pp. 433-438, fig. 1).—Of 43 young produced by normal-appearing mockingbirds, there were 18 full albinos. The other young were normal, but the sight of the albinos was deficient on bright days, probably resulting in lowered activity and lowered survival under natural conditions.

Interstitial cell stimulating hormone, I-III (*Endocrinology*, 27 (1940), No. 5, pp. 793-817, figs. 4).—Three papers in this series are presented.

I. *Biological properties*, H. Fraenkel-Conrat, C. H. LI, M. E. Simpson, and H. M. Evans (pp. 793-802) (Univ. Calif.).—The purified hormone was found to repair the interstitial tissue of the ovary of hypophysectomized rats, and to resemble the luteinizing hormone by increasing the weight of the accessories in ♂s and augmenting the effect of the follicle-stimulating hormone on the ovary alone in ♀s. More than 1 to 2 mg. of the interstitial-cell-stimulating hormone produced antagonistic antibodies when administered on 3 successive days. Pregnant-mare serum was reduced about 25 percent in its effects on ovarian enlargement in hypophysectomized ♀ rats. It appears that the extracted hormones may represent precursors of the actual secreted hormone, and differences in the responsiveness of strains of rats suggest that some are able to replace the active principle while others are unable to do so.

II. *Method of preparation and some physico-chemical studies*, C. H. LI, M. E. Simpson, and H. M. Evans (pp. 803-808) (Univ. Calif.).—The preparation of the highly purified interstitial-cell-stimulating hormone from sheep pituitary extracts is described.

III. *Methods of estimating the hormonal content of the pituitaries*, H. Fraenkel-Conrat, M. E. Simpson, and H. M. Evans (pp. 809-817) (Univ. Calif.).—Studies were made of the effect of implantation of total doses of from 10 to 200 mg. of fresh, stored, and frozen pituitary tissue on the development of the prostates, seminal vesicles, and testicles of normal and hypophysectomized immature ♂ rats and on the ovaries and uteri of ♀s. Marked responses in the weights of the accessories in ♂s and the gonads of ♀s produced by the fresh tissue implants were noted, but frozen and stored pituitaries produced markedly less stimulation of the adrenals as well as the accessories. A mechanism associated with the integrity of the cells may be necessary for the production of the maximum influence of fresh implants.

The isolation in pure form of the interstitial cell-stimulating (luteinizing) hormone of the anterior lobe of the pituitary gland, T. SHEDLOVSKY, A. ROTHEN, R. O. GREEP, H. B. VAN DYKE, and B. F. CHOW (*Science*, 92 (1940), No. 2382, pp. 178-180, figs. 3).—A purified hormone isolated from an extract of swine pituitary glands was found to cause interstitial cell stimulation in the ovaries or testes and caused the formation of corpora lutea in hypophysectomized rats.

Purification of the pituitary interstitial cell stimulating hormone, C. H. LI, M. E. SIMPSON, and H. M. EVANS. (Univ. Calif.). (*Science*, 92 (1940), No. 2390, pp. 353, 356).—Substances previously investigated at the California Institute of Experimental Biology and the Rockefeller Institute, noted above, did not seem identical.

Gonadotropic action of pituitaries from pregnant cows, A. NALBANDOV and L. E. CASIDA. (Wis. Expt. Sta.). (*Endocrinology*, 27 (1940), No. 4, pp. 559-566, figs. 2).—Pituitary glands removed from cattle at different stages of

pregnancy and with fetuses of different sexes were powdered, and definite amounts were implanted intramuscularly into immature ♀ rats. The potency was determined from the ovarian responses. There was a decline in gonadotropic potency of the cattle pituitaries from early to late pregnancy, giving a correlation of -0.46 between the fetal length and the gonad weight of the rats. This is considered due to the assumption that oestrogen secreted by the placenta has an inhibitory effect on the gonadotropic potency of the pituitary. Essentially the same effects were obtained on testis weight from injection of aqueous suspensions of the powder into chicks. The pituitaries from cows carrying ♀ calves had higher concentrations of gonadotropic hormone than those from cows carrying ♂ fetuses.

On the biological properties of highly purified gonadotropin from pregnant mare serum, H. H. COLE, R. I. PENCHEZ, and H. GOSS. (Univ. Calif.). (*Endocrinology*, 27 (1940), No. 4, pp. 548-553, figs. 8).—The gonadotropic response of immature normal and hypophysectomized ♀ rats and normal ♂ rats was not significantly different to varying doses of purified extracts and untreated pregnant-mare serum, leading to the conclusion that a high degree of purity can be obtained without disturbing the follicle-stimulating : luteinizing hormone ratio, or that the gonadotropic activity of mare serum is dependent on a single hormone. The latter view was favored, and the term "equine gonadotropin" was suggested for the hormone.

Non-specific augmentation with a highly purified follicle stimulating hormone fraction (Evans), F. BISCHOFF (*Endocrinology*, 27 (1940), No. 4, pp. 554-558).—In spite of efforts at purification, pituitary powder dissolved in water produced the same gonadotropic effects—follicle-stimulating, luteinizing, and antagonizing—in immature ♀ rats, further substantiating the multiple action of the follicle-stimulating hormone (E. S. R., 82, p. 469).

The quantitative determination of follicle stimulating and luteinizing hormones in mammalian pituitaries and a discussion of the gonadotropic quotient, F/L, E. WIRSCHI (*Endocrinology*, 27 (1940), No. 3, pp. 487-446, figs. 7).—Analysis of the varying effects of gonadotropic substances administered to immature ♀ rats led to the discovery of four different measurable effects (1) ovarian weight, (2) luteinization, (3) uterus enlargement, and (4) cornification of vaginal epithelium. The last was found most adequate for the follicle-stimulating hormone and was little affected by the presence of the luteinizing hormone. An independent assay of the luteinizing hormone was developed by study of the activation of the melanophores in the germ of the feathers on the breast and abdomen of the African weaver finch. A black dot or bar on the newly developing feather with a white tip was indicative of a positive reaction. The amounts of dry hypophyseal powder from 14 mammalian species required to give positive rat vagina, rat luteinizing, and weaver finch units are tabulated, and calculations of the ratios (gonadotropic quotients) in the different species are presented.

Influence of chlorophyll on the activity of gonadotropic extracts tested on normal and hypophysectomized immature female rats, J. H. LEATHERM and U. WESTPHAL (*Endocrinology*, 27 (1940), No. 4, pp. 567-572).—The gonadotropic effects of pregnant-mare serum, anterior-pituitary powder, extracts of anterior-pituitary glands, normal ♂ urine, and Follutein (human pregnancy-urine extract), with and without chlorophyll and mixed before injection or simultaneously injected, were compared. The response was determined by the ovarian and uterine weights in normal and hypophysectomized immature ♀ rats. Chlorophyll caused a slight augmentation in pituitary extracts. Normal ♂ urine was not affected, whereas pregnant-mare serum was completely inhibited by chlorophyll. Chlorophyll injected alone had no effect on the ovaries. Variations in the results may have been due to inert material in the extracts.

Are gonadotropic hormones destroyed while they exert their action on the ovary? H. SELYE (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 2, pp. 404-406).—Subcutaneous injections of follicle-stimulating and luteinizing hormones in various doses administered to hypophysectomized rats from which one ovary was removed caused essentially the same increase in the remaining ovary as was produced per ovary in normal ♀s. It is concluded that there is no significant destruction of the gonadotropic hormones while the expected reaction on the ovaries is produced.

Does testosterone propionate inhibit ovulation? H. O. BURDICK (*Endocrinology*, 27 (1940), No. 5, pp. 825, 826).—Notation is made of ovulations that evidently occurred and corpora lutea formed in rats injected with 5 daily doses of 0.5 mg. of testosterone propionate (*E. S. R.*, 82, p. 613).

Reaction of immature female guinea pigs to gonadotropic extracts, J. H. LEATHEM and W. F. STARKEY (*Pa. Acad. Sci. Proc.*, 14 (1940), pp. 109-114).—Vaginal opening was induced in from 5 to 12 days in 8 of 12 immature ♀ guinea pigs by the daily administration of from 2.5 to 20 rat units of an extract of pregnant-mare serum. It was accompanied with uterine hypertrophy and ovarian stimulation. An extract of castrate urine produced similar gonadotropic effects.

Response of the immature female cat uterus to estradiol benzoate (estrone), W. F. STARKEY and J. H. LEATHEM (*Pa. Acad. Sci. Proc.*, 14 (1940), pp. 87-90, figs. 3).—Injection of immature cats with oestradiol benzoate caused a slight endometrial stimulation after 5 daily treatments with 100 rat units. Oestrous endometrium was induced when the treatment was continued for from 10 to 15 days, but larger doses for 5 days did not give this response.

Activity of progesterone in spayed females not pretreated with estrin, H. SELYE (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 2, pp. 343, 344).—The daily administration of 15 mg. of progesterone to spayed ♀ rats produced progestational changes in the vagina and mammary gland development in contrast to the failure of small doses to have this effect in spayed animals.² Thus, if a sufficient dose of progesterone is given, it exerts its characteristic effects without sensitization of the test animal.

Further studies on the androgenicity of progesterone, R. R. GREENE, M. W. BURBELL and D. M. THOMSON (*Endocrinology*, 27 (1940), No. 3, pp. 469-472).—Progesterone administered subcutaneously in 10 daily doses of 2 mg. each to castrated immature rats was found to have androgenic effects as judged by material prostate increases in weight, but there was practically no change in the seminal vesicles. Intraperitoneal doses were not as effective as those given subcutaneously. Inadequate doses and intraperitoneal administration are suggested as reasons for failure to get androgenic effects from progesterone, as found in other studies.

The restoration of ovulatory cycles and corpus luteum formation in persistent-estrous rats by progesterone, J. W. EVERETT (*Endocrinology*, 27 (1940), No. 4, pp. 681-686, figs. 2).—Cyclic ovulation and corpus luteum formation were restored in rats exhibiting persistent oestrus by the daily administration of from 0.25 to 1 mg. of crystalline progesterone. Dioestrus occurred within 48 hr. in animals in which there was little likelihood of the occurrence of normal ovulation.

Induction of sexual receptivity in estrogen conditioned spayed female guinea pigs by orally administered progesterone and pregnenolone, A. L. SODERWALL (*Endocrinology*, 27 (1940), No. 5, pp. 840, 841).—Comparison

² *Soc. Expt. Biol. and Med. Proc.*, 34 (1936), No. 4, pp. 472-474.

of the effectiveness of progesterone in inducing copulatory response in spayed guinea pigs after oestrogen conditioning showed that 0.05 mg. was effective after subcutaneous injection, but 1 mg. was required when administered orally. Larger amounts of pregnenolone were required, and more was needed to produce progestational changes.

Production of persistent changes in the genital organs of immature female rats treated with testosterone, H. SELYE (*Endocrinology*, 27 (1940), No. 4, pp. 657-660, figs. 5).—The daily treatment of newborn ♀ rats with 1 mg. of testosterone propionate for 30 days caused uterine and ovarian atrophy and hypoplasia of the vagina without interference with somatic growth. A marked hypertrophy of the kidney and clitoris continued long after the cessation of treatment. Puberty was prevented.

The response of the testis to small doses of testosterone propionate, H. S. RUBINSTEIN and A. A. KURLAND (*Endocrinology*, 27 (1940), No. 3, pp. 461, 462).—Daily subcutaneous injections of 5γ of testosterone propionate to rats from 22 to 32 days of age not only did not have an inhibiting effect on testicular growth but there was some evidence of stimulation.

Inactivation of methyl testosterone in castrate male rats, G. R. BISKIND (Univ. Calif. et al.). (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 2, pp. 259-261).—Pellers of methyl testosterone implanted in the spleen failed to excite androgenic effects. However, positive results were obtained when the androgen was implanted subcutaneously or in the transplanted spleen, showing that with normal blood supply the spleen destroys the hormone.

Experimental study on the transplantation of the rat hypophysis [trans. title]. **A. WESTMAN and D. JACOBSSON** (*Acta Pathol et Microbiol. Scand.*, 17 (1940), No. 3, pp. 328-347, figs. 5; *Eng. abs.*, pp. 346, 347).—Implantation of hypophyses from young rats into the eye chamber of hypophysectomized ♀s was found to prevent the appearance of eosinophilic and castration cells in the transplanted lobe, even after removal of the ovaries. However, the transplants seemed to exert no gonadotropic activity, the ovaries were atrophied, and there were no vaginal cycles. The transplants had the expected effect on growth and behavior.

Studies on thyroidectomized rats with special reference to lactation and growth, D. V. PERLHIM (*Endocrinology*, 27 (1940), No. 3, pp. 494-499, fig. 1).—Rats in three successive generations were thyroidectomized, and the effects on lactation were estimated from the growth of the young. Growth rate was reduced 12.13 percent, and litter size was 6.36 as compared with 7.03 in the controls, but the numbers raised to weaning were practically the same. Gestation periods of thyroidectomized animals were prolonged about 24 hr. No cumulative effects on the young in successive generations were noted.

Appearance of skeletal abnormalities in the offspring of rats reared on a deficient diet, J. WARKANY and R. C. NELSON (*Science*, 92 (1940), No. 2391, pp. 383, 384).—Among 164 young born to rats on the rachitogenic diet of Steenbock, Black, et al. (*E. S. R.*, 54, p. 489), there were 57 with multiple congenital abnormalities involving shortening of the mandible and deformed extremities. Only 1 abnormal animal occurred among 510 young from rats on antirachitic diets.

The effect of thyroxine on the social order in flocks of hens, W. C. ALLEE, N. E. COLLIAS, and E. BEEMAN (*Endocrinology*, 27 (1940), No. 5, pp. 827-835).—Employing White Leghorn hens from flocks previously studied for the influence of the sex hormones on social order (*E. S. R.*, 82, p. 614), the authors found that thyroxine injections caused no changes in the social order except

when sufficiently large doses were administered to cause molting. Following such treatment a lowering of the social position occurred.

A hormone study of dubbed and normal cockerels, H. W. MARLOW and L. F. PAYNE. (Kans. Expt. Sta.). (*Poultry Sci.*, 19 (1940), No. 6, pp. 401-403).—Assays of the δ hormone in the feces and testes of normal and dubbed White Leghorn cockerels after 4.5 mo. of age showed no significant differences, and the histological development of the testes was similar in the two groups although the weight of the testes of dubbed birds was about twice that of normals. The body weight of the dubbed birds was about 15 percent greater than that of normal cockerels.

The effects of testosterone-propionate on the growth of comb, testes, and ovaries in chicks, C. A. HORN (*Pa. Acad. Sci. Proc.*, 14 (1940), pp. 27-31, fig. 1).—Injection of New Hampshire Red chicks with 2.5 and 5 mg. of testosterone propionate in single and multiple doses caused comb growth in the treated birds. Administration in several small doses was more effective than in single doses. The growth of the testes and, to a lesser extent, the ovaries was retarded.

Peculiarities of hormonal determination in the process of feather development, A. A. WORTKEWITSCH (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 26 (1940), No. 7, pp. 713-716, figs. 3).—Studies of the effects of thyroid secretions on the character of developing feathers in pigeons showed within from 5 to 6 days of thyroidectomy no marked changes in development. On the fourteenth day a decrease in the rate of growth of the plumage occurred, with a gradual narrowing of the lower part of the vane. The normal rate of feather growth was restored in thyroidectomized birds by the oral administration of 100 mg. of thyroxine per day.

Effect of hypophysis on the process of moulting in birds, A. A. WORTKEWITSCH (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 26 (1940), No. 4, pp. 406-408, fig. 1).—Injection into quails of thyrotropic extracts prepared from different zones from the anterior pituitary was found to provoke molting, beginning in 3 days in some cases. Premolting was not induced in thyroidectomized birds, showing the importance of thyroid in stimulating the molting process.

Effects of X-rays upon the regeneration of feathers in the common fowl, B. DeBOER (Univ. Mo.). (*Jour. Morphol.*, 67 (1940), No. 2, pp. 299-319, pl. 1).—Doses of from 2,000 to 3,000 roentgen rays caused the regeneration of plucked feathers in pigmented breeds to be white and continue white in subsequent regenerations. Feather follicles were destroyed or regeneration was delayed by longer exposures. Dried thyroid-gland extracts increased the rate of regeneration in feathers in nonirradiated regions or if irradiation was not sufficient to destroy the follicles.

The production of robin pigment in White Leghorn feathers by grafts of embryonic robin tissue, M. E. RAWLES (*Jour. Genet.*, 38 (1939), No. 3, pp. 517-532, pls. 3, figs. 3).—Grafts of small pieces of skin removed from robin embryos in early stages of development were made on 15 72-hr. White Leghorn embryos. Of 14 which lived beyond the nineteenth day of incubation, 5 showed colored down varying from blackish brown to pale cinnamon brown. In 1 which lived to sexual maturity, the colored down was replaced by juvenile mosaic-colored contour feathers and was later completely replaced by white (host) feathers. Feather structure was identical with that of the Leghorn host. Evidently the robin-colored feathers on the White Leghorn host arose from Leghorn feather germs, and the pigment was produced by robin melanophores which migrated

The relative potency of several estrogenic compounds tested on baby chicks of both sexes, S. S. MUNRO and I. L. KOSIN (*Endocrinology*, 27 (1940), No. 4, pp. 687-692).—Comparison was made of the effect of 10 daily injections of oestrone, oestradiol, oestradiol benzoate, and oestradiol dipropionate on the body, gonad, adrenal, comb, and oviduct (in ♀s) weights of chicks 1 week old. There was no effect on body weights of ♀s, but a slight depression in the weights of ♂s was evident. The gonads of both sexes were depressed. The oviducts were somewhat hypertrophied. The adrenals of ♂s were slightly stimulated, but in ♀s some depression was evident. The order of the effect of these hormones was as given above.

A modification of Riddle's method of prolactin assay, N. UYEL, M. ITOH, S. HAYATSU, and F. UYENO (*Science*, 92 (1940), No. 2393, pp. 435, 436).—A modification of the Riddle and Bates method for prolactin assay which involves the saving of a number of pigeons is described. If the crop sac of the pigeon proves transparent on incision of the skin, there is injected on 4 successive days a potent extract which will produce a degree of thickening of the crop sac on the other side also apparent after the skin is turned back.

Cold storage colts, V. R. BERLINER, F. E. COWART, and L. L. PHARIS. (Miss. Expt. Sta.). (*Jour. Hered.*, 31 (1940), No. 10, pp. 449-451, fig. 1).—Best results in the preservation of motility of stallion and jack sperm were obtained by storage of dilute semen with gradual cooling to from 40° to 45° F. The sperm showed a high degree of motility. However, only one of several mares conceived after insemination with 24-hr. stallion sperm and others after two inseminations with 24-hr. jack sperm. Pregnancy tests were positive for two further mares inseminated twice on successive days with jack semen. More success was indicated from the use of stallion and jack semen on successive days, even when division was made of the same sample, than when a larger amount was given in a single insemination.

An improved artificial vagina for the collection of stallion and jack semen, V. R. BERLINER. (Miss. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 96 (1940), No. 758, pp. 667-670, fig. 1).

Color markings in Rhode Island Red chicks as related to sex and adult color, F. A. HAYS. (Mass. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 1, pp. 69-74).—The relation of down pigmentation to sex and adult color in 8,713 purebred Rhode Island Red chicks hatched from 1937 to 1939 showed that color markings and stripes in the down had no commercial value as indicators of sex in the stock studied. About 90 percent of the ♂ chicks and 56 percent of the ♀s showed no color markings. There was no sex difference in the appearance of black and brown markings, although the adult color of the ♂s averaged slightly lighter than that of ♀s. A darker adult plumage color was associated with black-pigmented areas in the down. There was also less mottling in such birds than in cases where the down color was solid or pigmented with brown.

Turkeys fertile under lights (Pennsylvania Sta. Bul. 399 (1940), pp. 53, 54, figs. 2).—Data collected by P. H. Margolf indicate that hen turkeys respond to artificial illumination and lay eggs in 21 days, but 30 to 35 days' lighting is required to induce sperm production.

FIELD CROPS

[Agronomic experiments in Connecticut] (Connecticut [New Haven] Sta. Bul. 488 (1940), pp. 513, 514, 520, 524, 528-530).—The progress of research with field crops is again (E. S. R., 81, p. 501) noted briefly from breeding work with

and testing of corn and corn hybrids; fertilizer tests with potatoes and sweet potatoes; use of glass wool as a substratum in seed testing; and tobacco experiments at Windsor (E. S. R., 83, p. 485), including fertilizer tests, e. g., soybean oil meal v. cottonseed meal and urea v. organic nitrogen sources, tests of potash carriers and of sludge as a tobacco fertilizer, and placements, and irrigation and harvesting experiments.

[Field crops work in Pennsylvania], (C. F. NOLL, C. J. IRVIN, H. B. MUSSER, C. O. CROMER, E. L. NIXON, W. R. WHITAKER, D. E. HALEY, S. I. BECHDEL, A. L. BEAM, J. W. WHITE, and C. C. WEENEHAM (*Pennsylvania Sta. Bul.* 399 (1940), pp. 14-18, 21-23, 24, 25, 48-51, figs. 2).—Brief reports are made on the progress of breeding work with potatoes, oats, and red clover; inheritance studies with red clover; variety tests with corn (and hybrids), oats, soybeans, alfalfa, and grasses for fine turf; combining v. binding wheat and oats; response of potato varieties to soil reactions and planting dates; study of degeneration of potatoes due to heat; defects in market potatoes, and timing of potato sprays; potato and tobacco rotations; fertilizer experiments with tobacco, especially in regard to potassium content; response of pastures to fertilizer and manure; and compost materials for maintenance of fine turf grasses, resistance of grasses to "melting out" disease (*Helminthosporium* sp.), and tests of fungicides for its control.

Possibilities and limitations in the use of irrigated land for forage production in northeastern Nevada: Improvements in cultural practices, seeding methods, and livestock husbandry, coupled with timely and well-balanced use of ranch and range forage, favor ranch stability, C. E. FLEMING and C. A. BRENNEN (*Nevada Sta. Bul.* 154 (1940), pp. 34, figs. 7).—Experiments, 1934-39, made on a ranch in northeastern Nevada with the objective of increasing forage yields on irrigated, privately owned land in order to partly make up the inadequate productive capacity of available range lands in the congested grazing areas, included tillage and cultural practices, trials of introduced grasses and clovers and rotation, and intermittent grazing of pastures. A foreword by S. B. Doten describes the problem, and the application of the findings and their advantage in practice in the area are discussed.

In establishing introduced grasses and clovers, best results were obtained on a fine compact seedbed, by planting early to take advantage of available spring precipitation and a full growing and irrigating season, and by planting seed at a one-fourth-inch depth alone or with a light seeding (40 lb. per acre) of nurse crops, such as hull-less barley, which will not smother the seedlings. Seed mixtures of both clovers and grasses gave the best results for either pasture or hay production. Special combinations of Kentucky bluegrass, meadow fescue, timothy, orchard grass, white Dutch clover, mammoth red clover, alsike clover, alfalfa, redtop, crested wheatgrass, brome grass, and sweetclover are recommended for pasture alone and for hay and second-growth pasture on land of different levels of soil fertility, moisture supply, drainage, and elevation.

Intermittent grazing trials showed that pasture grasses irrigated and rested for 2 mo. before use had about double the carrying capacity obtainable when grazing began as early as livestock could use the forage beneficially. According to hay production records, good silty loam soils rich in humus and well irrigated with good drainage could produce from 1.75 to 2 tons of hay per acre, whereas light silty loams low in humus with inadequate control of overflow and drainage water yielded from 0.66 to 1.20 tons. Second-growth grazing trials indicated that good soils with an adequate moisture supply after haying or where irrigation water is available July 15 to August 15 might

produce stands of succulent second-growth grasses and clovers from 8 to 15 in. high if hay is cut early enough to insure about 1.5 mo. of good growing weather.

Grass investigations of the North Dakota Agricultural Experiment Station, W. WHITMAN (*North Dakota Sta. Bimo. Bul.* 3 (1940), No. 2, pp. 22, 23).—Grassland research at the station and substations is outlined.

Deferred grazing of bluestem pastures, K. L. ANDERSON (*Kansas Sta. Bul.* 291 (1940), pp. 27, figs. 3).—Deferred and rotation grazing of the bluestem grasses were compared, 1916-22, with season-long grazing by purebred Herefords. The carrying capacity was not increased by deferring grazing until September 1 because maximum or uniform utilization could not be obtained. However, when the deferred grazing period began June 15 a decided increase in carrying capacity occurred.

In comparisons 1927-38, the pasture with grazing deferred until July 1 had a higher carrying capacity than those grazed season-long either in terms of time actually grazed or when converted to a 6-mo. grazing season. The deferred pasture yielded an average of 85.1 lb. of beef per acre per grazing season, or 1.32 lb. of animal units per grazing day, compared to 37.4 and 42.5 and 1.17 and 1.09 lb., respectively, for the two pastures grazed season-long. Although seasonal gains per animal unit were somewhat smaller on deferred pasture, about twice the acreage and from 40 to 50 days longer each year were required on pastures grazed season-long to produce about one-third more gain per animal unit per grazing season. Stands of grass on deferred pasture were maintained in better condition, although it had been used much harder. At the end of each grazing season it had a better grass cover to afford protection against runoff and erosion during winter and spring. When the depleted grasses were replaced following severe climatic conditions during the later years of this experiment, considerable sand dropseed and buffalo grass appeared on pastures grazed season-long, whereas in deferred pasture, side-oats grama largely made up the replacement.

To permit deferred grazing it appears advisable to provide other forms of pasture during May and early June. Where the stand and vigor of the pasture vegetation are good, a plan of a deferred system of grazing is suggested which obviates supplemental pastures.

Abstracts of pasture literature, A. S. DAHL (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1937, *SUS-TP-15*, pp. [2]-369).—Pasture publications by State experiment stations and extension services published up to 1934 and totaling 642, abstracted by C. R. Enlow, H. N. Vinall, M. A. Hein, and R. M. Coffman, are arranged by States and authors under 39 subject matter heads. Consult also related digests by Pieters (*E. S. R.*, 78, p. 619).

Is tripping necessary for seed setting in alfalfa? H. M. TYSDAL (Nebr. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 8, pp. 570-585, figs. 2).—In studies at Scotts Bluff, Nebr., and in several seed-producing areas of the United States in 1939, the respective percentages of alfalfa flowers tripped naturally ranged from 11 to 63 and of flowers forming pods (1) without tripping 0-6, (2) naturally 5-47, (3) artificially tripped 27-91, and (4) under bags 1-5 percent. The *Megachile*, *Nomia*, and *Bombus* sp. of bees were the most important insects in tripping alfalfa in different sections of the country. Honey bees tripped about 1.1 percent of the flowers visited, and when present in abundance might be beneficial. Cross-fertilized flowers produced about three times as much seed as self-pollinated flowers, and the three genera of insects are particularly adapted for cross-pollinating as well as tripping. Beneficial insects were found most active during the middle of the day and at the higher temperatures in bright dry weather. Many cases

of poor crops were found in seed-producing areas, yet all factors seemed favorable for a seed crop, including good bloom and no harmful insects. Under such conditions lack of tripping might be the determining factor.

Velvon, a new smooth-awned barley, R. W. WOODWARD and D. C. TINGEY. (Coop. U. S. D. A.). (*Utah Sta. Bul.* 293 (1940), pp. 11, figs. 2).—Velvon, a new smooth-awned barley with relatively stiff straw and a high degree of resistance to races or strains of covered smut found in Utah, was selected from a cross between Colorado selection 3063 (Coast × Lion) and Trebl. Comparative tests in Utah and other Western States showed Velvon to be equal in yield, quality, and other agronomic characters to the better of the adapted varieties of the region. It has largely replaced Trebl in Utah.

The analysis of lattice and triple lattice experiments in corn varietal tests, I, II. (Coop. U. S. D. A.). (*Iowa Sta. Res. Bul.* 281 (1940), pp. 66, figs. 3).—This study is in two parts.

I. Construction and numerical analysis, G. M. Cox and R. C. Eckhardt.—The field plans, statistical methods, experimental results, and mathematical theory are presented for two incomplete block designs, the lattice and triple lattice, which in addition to the lattice square designs (E. S. R., 81, p. 369) are well adapted to testing large numbers of varieties. Two experiments, consisting of yield tests of 81 double crosses of corn, are used to illustrate a new method of analysis in which the interblock information is recovered. The analysis is so presented that it can be adopted as the standard method of analyzing lattice and triple lattice experiments. Recovery of interblock information and reduction of block size from 81 to 9 plots per block resulted in a notable increase in precision when compared with the randomized complete block designs. The gain was 85 percent for the lattice and 73 for the triple lattice experiment. The use of covariance analysis is illustrated for the latter.

II. Mathematical theory, W. G. Cochran.—For each design the mathematical basis is given for the estimation of the varietal means together with their standard errors, the weights assigned to intra- and interblock error variance, and tests of significance. Tables indicate the efficiencies to be expected from the use of these designs instead of randomized complete blocks.

Grading hybrid seed corn for planting, R. H. Rupp. (Univ. Ill.). (*Agr. Expim.*, 26 (1939), No. 4, pp. 143, 153).—The method of seed grading described indicates the proper sizes of planter plate calls for planting corn of different kernel sizes.

Foxtail millet in Colorado, J. J. CUMIS, J. F. BRANDON, and R. M. WEHME. (Coop. U. S. D. A.). (*Colorado Sta. Bul.* 461 (1940), pp. 12).—Cultural and varietal tests with foxtail millet at Akron, Colo., 1909-39, suggest drilling from 25 to 30 lb. of seed per acre between May 15 and July 1 just after a good rain and cutting for hay before or at first heading. The Siberian variety is recommended because of high hay yields and also good yields of seed, although Dakota Kusk, White Wonder, Goldmine, and German foxtail millets have closely approached it in yield tests. The crop is indicated for dry land in eastern Colorado, but it has not yielded well at high altitudes and alfalfa and other crops have produced more and better forage on the irrigated lands. The highest yields of foxtail millet were obtained on fallow, lowest on Sudan grass stubble land, and intermediate yields on winter wheat and spring-seeded small grain stubble land. Fallow or late spring-planted crops, as corn or sorghum, followed millet in rotations much better than did fall- or early spring-sown crops, as wheat, oats, or barley. Feeding trials at Akron showed that for fattening lambs foxtail millet hay slightly surpasses sorgo fodder if cut early, but is slightly inferior if cut when the seed is ripe. The seed is slightly less

palatable than proso and has about 83 percent of the feeding value of corn or proso, but for best results should be ground finely before fed to livestock.

The progeny test as a measure of the types of seed-development in *Poa pratensis* L., F. W. TINNEY and O. S. AAMODT. (Univ. Wis. and U. S. D. A.). (*Jour. Hered.*, 31 (1940), No. 10, pp. 456-454, figs. 5).—No variant types were found in 48 of 102 progenies grown as individual plants from seeds produced in single open-pollinated panicles of Kentucky bluegrass. In the total population, 1.6 percent were variant types, and the highest percentage of variants in any progeny was 21.9. Remarkable uniformity in type was observed among progenies collected in different climatic regions. The fact that a progeny is uniform throughout and practically identical with its seed parent indicates that the plants arose apomictically. Presence of atypical plants in an otherwise uniform progeny indicates that these plants may have arisen as a result of gametic union or mutation. The breeding studies described confirm cytological findings that apomixis is the predominant type of reproduction. This predominantly parthenogenetic origin of seeds evidently can be used to advantage by plant breeders and seedsmen.

Reproduction in some *Poa* species, V. ENGELMANN (*Canad. Jour. Res.*, 18 (1940), No. 10, Sect. C, pp. 518-521).—*P. arctica*, *P. alpigena*, and *P. alpina* from Greenland, *P. alpina* from Georgian Bay, Ont., and *P. pratensis* from Gaspé, Que., were observed to be all apomictic (parthenogenetic) and pseudogamous. In pseudogamy the pollen tube enters the stigma and activates the apomictic embryo sac to development, but usually does not enter ovarian tissue to achieve fertilization of the ovule. Pollen from any one species germinated readily and with a high percentage on the stigmas of any one of the others. Pollen sterility did not exceed 2 percent.

Potato digger adjustment in relation to tuber bruising, E. V. HANSEN and O. N. TURNER. (Cornell Univ.). (*Amer. Potato Jour.*, 17 (1940), No. 8, pp. 191-197, figs. 3).—Factors involving types of potato diggers, their adjustment, and operations in relation to tuber bruising were studied on 32 New York farms during 3 yr. On the basis of reduction in bruising obtained, speed of the apron, type of digger, and depth of digger point may be considered most important under prevailing conditions. However, attention to any one or a combination of several factors might result profitably to a grower according to his particular conditions. Other factors were agitation, apron tension, rear chain drive, and shaker-box padding. See also an earlier note (E. S. R., 80, p. 478).

Photothermal induction of flowering in sugar beets, F. V. OWEN, E. CARSENER, and M. STOUT. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 2, pp. 101-124, figs. 7).—"Photothermal induction" of flowering, suggested by E. J. Kraus, signifies induction of flowering by both light and temperature. The effect of photoperiod in beets was found to be associated intimately with and dependent upon temperature exposure. The favorable effect of low-temperature exposure to subsequent flowering was demonstrated with germinating seed, with beets after cold storage, and with growing plants. Certain factors influencing bolting in the field acted indirectly by altering the range or duration of effective temperatures. Thus, shade increased bolting by lowering the soil temperature and consequently that of the beet crown under conditions where unshaded soil was too warm. Irregularity in germination of seeds under temperatures conducive to induction of flowering resulted in variation in bolting because seeds retarded in sprouting escaped some of the low-temperature influence.

Both annual and biennial beets showed genetic variability in response to temperature and photoperiod. A factor for bolting designated *B'* and regarded as allelic to *B*, discovered by Munerati (E. S. R., 66, p. 816) and further described by Abegg (E. S. R., 76, p. 462), was identified by hybridizing selected parental material and testing backcross progenies under controlled environmental conditions.

Windrowing and storing of sugarcane in Louisiana following injury by freezing temperatures, J. I. LAURITZEN, C. A. FORT, and R. T. BALCH (*U. S. Dept. Agr., Tech. Bul. 736 (1940), pp. 44, figs. 4*).—The relation of different degrees of freezing injury to the behavior of sugarcane of the varieties Co. 281 (windrowing variety) and Co. 290 (near-windrowing variety) when standing, in the windrow, and stored at different conditions of temperature and humidity was studied at or near the United States Sugar Plant Field Station, Houma, La. See also earlier notes (E. S. R., 70, p. 614; 72, p. 471).

Under mild freezing conditions the regions of the sugarcane stalk in the spindle and at the tips of the leaves are first to be injured, and as freezing conditions become more severe the injury extends downward killing terminal buds, eyes, and stalk. The lower eyes are the last to remain sound. As long as any eyes are sound at the time of windrowing, Co. 281 and Co. 290 will windrow from 3 to 6 weeks under the usual weather conditions during the harvest in Louisiana without serious increase in acidity, decrease in pH value, and gum formation. When only an occasional eye remains sound or all the eyes are killed, considerable loss of solids, including sucrose in cane in the windrow, may occur, although the purity may remain high and the development of acidity and the formation of gum may be slow. Fermentation involving production of ethyl alcohol was associated with such destruction of solids. After all the eyes have been killed, the behavior of cane in the windrow or in storage seems to depend upon a degree of injury at present not measurable by physical symptoms. The development of acidity and gum formation may be slow or fast enough to make the cane unfit for sugar manufacture in a few days. Behavior of cane exhibiting different degrees of freezing injury when stored at different temperatures and relative humidities and when windrowed was similar as to the occurrence or nonoccurrence of fermentive changes. Cane showing no fermentive changes in the windrow showed none when stored at different temperatures (50°–80° F.) and relative humidities, whereas badly damaged cane showed fermentive changes under both sets of conditions. The data appear to justify, when possible and practicable, the windrowing of cane before injury by freezing temperatures, and also, as a protection against further injury, the windrowing of cane damaged by freezing temperatures in which sound eyes are found.

Sunflower as an indicator plant of boron deficiency in soils, C. E. SCHUSTER and R. E. STEPHENSON. (Oreg. Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 8, pp. 607–621, figs. 4).—Sunflowers, heavy users of boron, could be employed successfully as indicators of the level of available B in soils. B deficiency is shown by cessation of growth of the terminal bud, reduced dry weight, and abnormal leaf characteristics, but the deficiency may be masked by other deficiencies unless the plants are supplied with enough available nutrients for good growth. Soils long clean cultivated and low in organic matter have contained less available B than uncultivated soils of the same type. Humus depletion seemed to aggravate B deficiency, which could be corrected by addition of enough compost to the soil. Soils varied widely in amount and distribution of available B, attributable to their origin and weathering, cultivating practices, erosions, humus supply, and other factors. Available

B was usually greatest in the upper 3 ft. of the soil, but the shortage was often extreme in depths below 3 ft.

Tobacco through three centuries, H. M. MATTHEWS. (Va. Expt. Sta.). (*Commonwealth [Va. State Chamber Com.]*, 5 (1938), No. 9, pp. 17-20, figs. 5).—An account of the development and status of tobacco production in Virginia.

Soil temperature and growth of Marquis wheat, D. J. WOBT (*Plant Physiol.*, 15 (1940), No. 2, pp. 335-342, figs. 3).—When Marquis spring wheat was grown, 1937-39, in the greenhouse, the plant height, root length and extent, and tiller number decreased as the soil temperatures rose from 22° to 42° C. The greatest dry weights of tops and roots and total dry weight, at time of harvest, were found to result in plants grown at 22°, the lowest temperature maintained. The top:root ratio reached a maximum at from 30° to 34°, falling again as the soil temperature rose further. Leaves were largest at 22° and became lighter in color above 32°. Increasing soil temperatures from 22° to 34° accelerated heading by as much as 11 days, while temperatures above 34° retarded or prevented it.

Time of maturity and variety yields in 1940, T. E. STOA (*North Dakota Sta. Bimo. Bul.*, 3 (1940), No. 2, pp. 20-22).—Growing conditions in North Dakota in 1940 generally favored wheat varieties that headed early. Drought and high temperatures in late July appeared to account for greater injury and less satisfactory yields in the late varieties. The earlier oats also were outstanding in localities where drought was a factor, whereas differences were not great in other localities, indicating performance over a period as a more dependable basis for judging a variety than performance in any one year. "Earliness alone is not a sufficient recommendation for a variety. But when earliness is combined with a good capacity for yield it can be a distinct advantage."

Proceedings of the Association of Official Seed Analysts of North America, 1938 (*Assoc. Off. Seed Anal. North Amer. Proc.*, 30 (1938), pp. 279, figs. 19).—Papers presented at the thirtieth annual meeting at Guelph, Ont., June 21-24, 1938, included The Training of Beginners in Purity Analysis, by E. F. Sirrine (pp. 14-17), Fundamentals of Seed Control, by W. A. Davidson (pp. 87-90), Some Problems in Seed Marketing, by W. A. Wheeler (pp. 104-106), Germination Requirements of the Seed of Some Introduced and Native Range Grasses, by Y. K. Toole (pp. 227-243), Moistening and Drying as a Pretreatment in Germinating Seeds of *Poa compressa*, by A. M. Andersen (p. 246), and The Germination of the Seed of *Alpine media*, by L. A. Kanipe (pp. 249-252) (all U. S. D. A.); The Occurrence of Weed Seeds in Commercial Vegetable Seeds, by C. A. Stahl (pp. 64-67); Variety and Varietal Purity (pp. 68, 69), and Seed Testing in Alabama (p. 97), both by L. N. Allen; Advisability Versus Inadvisability of Establishing Standards on Agricultural Seeds, by M. H. Snyder (pp. 71-73); Opportunity for Cooperation Between the Extension Services and Seed Laboratories of the United States, by F. A. McLaughlin (pp. 73, 74); The Unexplored Avenues of Crop Improvement, by W. T. G. Wiener (pp. 91-96); Seed Control in Tennessee, by F. H. Spanier (p. 98); Seed Price Versus Seed Quality, by J. R. Casey (pp. 99-103) (Ark. Expt. Sta.); Progress in the Seed Industry, by E. M. Page (pp. 107, 108); Seed Laboratory Record Card Data, by W. L. Goss (pp. 109, 110); The Seed Sample and Its Limitations (pp. 111, 112), and Selecting Beet "Seeds" for Germination Testing (pp. 269, 270), both by M. T. Munn, Some Observations Regarding Noxious Weed Seed Determinations, by M. E. Woodbridge (pp. 113-117), Chemical Control of Molds When Germinating Lima Beans, by W. Crozier and O. Nelson (pp. 189-194) (E. S. R., 82, p. 785), Hard-Shell Seeds in Peas and Beans (pp. 221-226),

and Injuries to Seedlings Induced by Chemicals Dissolving From Germinator Trays (pp. 253, 254), both by W. Crosier and S. Patrick, Canada Bluegrass Seed Is Sensitive to Germinative Conditions, by S. R. Patrick (pp. 247, 248), and Treatment of Seeds With Indolebutyric Acid and Its Effects, by D. E. Welmer (pp. 263-268) (E. S. R., 82, p. 750) (all N. Y. State Sta.); A Comparison of the Regular Method and a Fractional Method of Analyzing Orchard Grass Seed for Purity, by J. S. Jones (pp. 118, 119); A New Seed Blower (pp. 120-182), and Further Studies on the Distribution of Weed Seeds in, and of Results of Germination Tests on Replicate Samples (pp. 177-188), both by C. W. Leggatt; Uniform Techniques for the Analysis of Small-Seeded Grasses (pp. 133-171), and Detection and Classification of Seed-Borne Organisms, Their Effect on Germination and Their Control by Seed Disinfection in Laboratory and Field (pp. 195-213) (E. S. R., 82, p. 783), both by R. H. Porter (Iowa Sta.); Farm Demonstrations as a Measure of Seed Viability in Alfalfa, Red Clover, and Sweet Clover, by E. P. Sylvester (pp. 172-176) (Iowa State Col.); Abnormalities in the Germination of Lima Beans, by J. G. Fiske (pp. 214-217) (N. J. Stas.); Observations on Lima Bean Germination, by V. Drake and B. R. Atwater (pp. 218-220); Laboratory Germination Studies With *Agropyron smithii*—Preliminary Results, by W. D. Hay (pp. 244, 245), and Seed Value of De-hulled Oats—Preliminary, by W. O. Whitcomb (pp. 255-258) (both Mont. Sta.); Germination Studies of the Hull-less Seeds of Reed Canary Grass, by G. C. Morris (pp. 259-262) (Wis. Sta.); The Use of Trial Grounds for Variety Testing, by A. Hope (pp. 271, 272); and Classification and Germination of Herb Vegetable Seeds, by H. E. Vegiard (pp. 273, 274). Technical problems were also dealt with in committee reports. Earlier reports have been noted (E. S. R., 80, pp. 43, 44).

Proceedings of the Association of Official Seed Analysts of North America, 1939 (*Assoc. Off. Seed Anal. North Amer. Proc.*, 31 (1939), pp. 143, figs. 5).—The papers presented at the thirty-first annual meeting at Madison, Wis., August 1-4, 1939, included A Decade of Progress in Seed Testing in Alabama, by L. N. Allen (pp. 10-15); Comparison of Time Required for Complete and Modified Analysis of Seeds (pp. 28-34) and A Suggested Policy for the Evaluation of Hard Seeds (pp. 86-94), both by W. O. Whitcomb (both Mont. Expt. Sta.); Application of Tolerances to Seed Analysis and Law Enforcement, by C. W. Leggatt (pp. 94-101); Testing of Native Grass Seeds at the Kansas State Seed Laboratory, by E. L. Norris (pp. 101-104); Identifying the *Festuca* Species in Commerce, by M. T. Munn (pp. 104, 105), The Ineffectiveness of Certain Seed Treatments To Reveal Origin of Red Clover Seed, by D. E. Welmer (pp. 106-108), Influence of Chemical and Thermal Treatments on Infection of Cruciferous Seedlings by *Alternaria* spp. and *Rhizopus nigricans*, by W. Crosier and S. Patrick (pp. 116-120), and Some Fungi Associated With Grass Seed, by W. Crosier and D. E. Welmer (pp. 120-121) (all N. Y. State Sta.); The Pubescent Characteristic of Red Clover, *Trifolium pratense*, as Related to the Determination of Origin of the Seed, by E. A. Hollowell (p. 109), and Notes on the Viability of the Impermeable Seed of *Vicia villosa*, Hairy Vetch, by V. K. Toole (pp. 109, 110) (both U. S. D. A.); Notes on Flower Seed Germination, by B. R. Atwater (pp. 111-113); Boiling-Water Treatment an Aid in Germinating Bur Clover Seed, by J. E. Casey (pp. 114, 115); The Hemocytometer Method for Detecting Fungous Spore Load Carried by Wheat Seeds, by W. N. Rice (pp. 124-127), and Laboratory and Field Germination of Treated and Untreated Beet Seed, by R. H. Porter and W. N. Rice (pp. 127-130) (both Iowa Sta.); and State Seed Laws and Their Application to Dealer and Grower, by R. U. Crouley and C. P. Bull (pp. 130, 131). Technical problems were also dealt with in committee reports.

Chemical control of annual weeds in flax and grain fields, E. A. HELGESON and D. GERBACHT (*North Dakota Sta. Bimo. Bul.*, 3 (1940), No. 2, pp. 7-10, figs. 2).—Sinox (E. S. R., 83, p. 55) when sprayed on Bison flax nearly in bloom was most satisfactory for general use in a 1 : 100 concentration and particularly for mustard, whereas purslane and prickly lettuce were injured little. Sprayed flax averaged 10.68 bu. per acre, and untreated 4.59 bu. The pigweed and Russian-thistle infecting Thatcher spring wheat about 25 cm. high were not affected much by sprays, although pigweed sprayed July 24 was injured more severely and the few mustards present were killed. Plants readily killed included water pod (*Eulisia nyctelia*), marsh-elder, ragweed, field mustard, French weed (*Thlaspi arvense*), wild buckwheat, and the potato. Other plants showing varying degrees of injury are listed.

Western bitterweed control studies, W. H. DAMERON. (Tex. Expt. Sta.). (*Tex. Agr. Workers' Assoc. Mtg., Papers*, 1939, pp. [122-126]).—The history of bitterweed (*Actinea odorata*), causes and prevention of its spread, control measures, and prevention of poisoning of livestock are reviewed from station studies on the plant (E. S. R., 68, p. 673; 78, p. 247).

HORTICULTURE

[Horticultural studies by the New Haven Station] (*Connecticut [New Haven] Sta. Bul.* 438 (1940), pp. 514-516).—Included are brief reports on studies in the development of sweet corn hybrids; environmental factors affecting the color and sugar content of beets; improvement of squash by inbreeding and recombination; the breeding of disease-resistant cantaloups and cucumbers, blight-resistant celery, and strawberries; and the genetics of corn (coop. Univ. Mo. and U. S. D. A.).

[Horticultural investigations by the Pennsylvania Station], E. I. WILDE, R. P. MEHL, C. B. LINK, R. D. ANTHONY, H. K. FLEMING, C. O. DUNBAR, W. S. CLARK, JR., N. F. FARRIS, F. N. FAGAN, W. R. WHITACE, G. J. STOUT, C. E. MYERS, A. L. HASKINS, M. T. LEWIS, E. M. RAHN, W. B. MACK, W. THOMAS, J. W. SINDEN, and H. W. POPP (*Pennsylvania Sta. Bul.* 399 (1940), pp. 25-27, 40-44, 61-65, 66, figs. 3).—Included are brief reports on variety tests with iris; the use of growth-promoting substances in stimulating root development in cuttings; effect of native peats in the culture of roses; effect of incorporating sand with soil in growing Better Times roses; the value of Mallory rootstocks in apple culture; deep planting as a means of inducing rooting from the scions of apple grafts; the value of growth substances in promoting the rooting of apple cuttings; the value of selecting relatively frost-free orchard sites; harmful effects of continuous cultivation of orchards; sod as a prevention of erosion in peach orchards; cover crops for peach orchards; new varieties of cherries and peaches; the need for standardizing apple packages; irrigation of vegetable crops; improvement of tomatoes, peppers, rhubarb, and lettuce; testing of sweet corn hybrids and varieties; testing of vegetable varieties; placement of fertilizer for vegetable crops; foliar diagnosis as an indication of the nutritional needs of greenhouse tomatoes; gypsum as an amendment for mushroom composts; and light requirements of *Brassica rapa* seedlings.

Effect of hormodin A, a growth substance, on the rooting of cuttings, M. A. MAXON, B. S. PICKETT, and H. W. RICHIEY (*Iowa Sta. Res. Bul.* 280 (1940), pp. 929-973, figs. 56).—In cooperation with the Boyce Thompson Institute, a total of approximately 50 species and varieties of horticultural plants were used over a 2-yr. period in testing this proprietary growth substance, said to contain indolebutyric acid. Herbaceous cuttings almost without exception responded favorably to treatment at one or more of the concentrations used, unless old

woody tissue was employed or decay had entered the picture. The optimum concentration for herbaceous cuttings ranged between 2.5 and 10 p. p. m. The rooting response of greenwood cuttings of many species of deciduous trees and shrubs was variable and was influenced by prevailing climatic conditions. Some species, notably the apple, failed to root with any treatment. The spread of effective concentrations, 1.25 to 80 p. p. m., was much wider for greenwood than for herbaceous cuttings. However, only a few of the species withstood treatments stronger than 40 p. p. m. Evergreen cuttings were generally slow to root and sometimes decayed before the roots were initiated. Treated cuttings were more subject to injury by high temperatures and moisture fluctuations than were the untreated controls. The concentration required for evergreens tended to be high, most of the species ranging between 20 and 80 p. p. m. In general, results with hardwood cuttings were unfavorable. Practical suggestions are offered.

The use of copper resinate as a treatment for paper pots, M. LEATHERMAN and V. R. BOSWELL. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 951-955).—To test the effect on plants of copper resinate incorporated in paper containers used for growing vegetable plants, paper cups dipped in carbon tetrachloride solution with different concentrations of copper resinate were filled with soil and planted with small Marglobe seedlings. Part of each lot of the pots was plunged into soil. In a test conducted in December growth in the treated pots was not significantly different from that in clay pots, but was significantly greater than that in the untreated paper pots. In a second test the copper resinate treatment was again beneficial with respect to growth. The differences were greater in the case of paper pots planted in soil than in those above the soil. Noting no apparent correlation between the amount of copper resinate in the pots and growth, the authors suggest that the lowest concentration was adequate to suppress the activity of microorganisms. In no case was there any evidence that any of the amounts of copper resinate used were toxic to tomato plants.

[Results of variety tests] (*Pennsylvania Sta., Jour. Ser. Papers* 930 (1939), pp. 7, figs. 12; 932, pp. 10; 934, pp. 9, figs. 61; 940, pp. 7; 942, pp. 8; 998 (1940), pp. 8; 999, pp. 7; 1002, pp. 8, figs. 13; 1007, pp. 7; 1008, pp. 6, figs. 25).—There is presented in mimeographed form the following papers: No. 930, Bean Variety and Strain Trials, 1939; No. 932, Pepper, Celery, Spinach, Muskmelon, and Watermelon Trials, 1939, and No. 934, Pea Variety and Strain Trials, 1939, all by E. M. Rahn; No. 940, Tomato Variety and Strain Trials, 1939, and No. 942, Sweet Corn Variety and Strain Trials, 1939, both by E. M. Rahn and G. J. Stout; and No. 998, Sweet Corn Variety and Strain Trials, 1940, No. 999, Tomato Variety and Strain Trials, 1940, No. 1002, Pea and Edible Soy Bean Variety and Strain Trials, 1940, No. 1007, Cabbage Variety and Strain Trials, 1940, and No. 1008, Cucumber and Celery Variety and Strain Trials, 1940, all by E. M. Rahn.

The Golden Gopher muskmelon, T. M. CURRENCE, C. J. EIDE, and J. G. LEACH. (Minn. Expt. Sta.). (*Minn. Hort.*, 68 (1940), No. 9, p. 171, fig. 1).—A description is presented of a new muskmelon developed by the station.

The Essary tomato, D. M. BAILEY (*Tennessee Sta. Cir.* 71 (1940), pp. 4, figs. 3).—Obtained by mass selection from the Marglobe variety, the Essary tomato is described as to vine and fruit characters and yielding capacity. Over the 3-yr. period, 1938-40, at the Mericourt substation, Essary outyielded both Certified Marglobe and Certified Indiana Baltimore in average total yield and average yield of U. S. No. 1 fruit.

New methods of fertilizing tomatoes, J. B. HESTER (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 935-938).—Based on a series of field experiments conducted

in 1938 and 1939, the author suggests that tomatoes should be supplied liberally with P in the row under the plant before, or at, the time of planting, but that N and K should be used sparingly at this time. It is suggested that the abundant fertilization with N and K should be in the form of side dressing on sandy soils and broadcast or plowed under on heavy soils. By delaying the application of N and K the plants receive these materials at the time they need them.

The effect of the size of the fertilizer application on yield of greenhouse tomatoes, I. C. HOFFMAN. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 927-929).—With the so-called standard fertilizer treatment as a control, greater and lesser amounts were used to determine whether deviations from the standard treatment might be profitable. With the Globe tomato set in greenhouse beds about January 20 the plot which received the standard application yielded the largest amount of marketable fruit. Where the amount of fertilizer was trebled or quadrupled yields became progressively less. Much the same type of results was secured with the Marhio tomato planted at a different period.

The effect of calcium and potassium fertilizers on the solidity and the calcium and potassium content of canned tomatoes, C. B. SAYRE, Z. I. KERTESZ, and J. D. LOCONTI. (N. Y. State Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 5, pp. 389-394).—Using the Nystate variety, it was found that on a soil containing abundant natural supplies of calcium, but insufficient potassium for maximum crop yields, the addition of calcium salts or potassium salts had no appreciable effect on the calcium or potassium content of the tomatoes produced nor on the firmness of the canned fruits as measured by their drained weight.

Some effects of maturity on the marketability of Florida tomatoes, W. M. FIFIELD. (Fla. Expt. Sta.). (*Fla. State Hort. Sci. Proc.*, 52 (1939), pp. 143-146).—With practically all of the Florida tomato crop harvested in the green-ripe stage, the author studied the effects on yield and market quality of leaving tomatoes on the vines until they began to change color. Total yields of the green-ripe and "turning" plots were about the same, but the yield of No. 1 fruit was almost twice as great on the green-ripe plots due to overripe rejects and a greater incidence of cracking and other injuries on the turning plots. However, in ripening tests following harvest the turning fruits ripened from 95 to 100 percent of salable tomatoes within a 6- or 7-day period as compared with an average of only 68 percent for green-ripe tomatoes. When shipped to northern markets consignees stated that the turning fruit compared favorably with home-grown tomatoes.

The interaction of nitrogen, potassium, and phosphorus on growth of young apple trees in sand culture, L. P. BAYNE, W. C. BAYNES, and L. O. REGETIMBAL. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), p. 43).—Observations on 1-yr. York Imperial and Delicious apple trees grown in sand cultures in the greenhouse showed that the concentration of P and K in the nutrient solution had no significant effect on growth at a low N level, 10 p. p. m., but at higher levels (25 and 100 p. p. m.) growth increased with increasing supplies of P and K. No visible K or P deficiency symptom was noted in any treatment. Increased growth resulted from increased N supply at all levels of both P and K. The contents of N, P, and K in the leaves were directly influenced by the supply in the nutrient solution. High P increased the N content of the leaves, but K had no significant effect. With all three levels of K, 100, 10, and 4 p. p. m., the amount of K in the leaves tended to increase with the decrease of N. P content of the foliage also increased

with decreasing N. In the high P cultures there was a tendency for the P content of the foliage to increase with decreasing K.

Correlation of fruit color in apples to nitrogen content of leaves, J. R. MAGNESS, L. P. BATJER, and L. O. REGEIMBAL. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 39-42, fig. 1).—Utilizing a group of 8-year-old Rome Beauty trees just coming into fruiting and embraced in a nitrogen fertilizer study, there was observed an inverse relationship between the amount of N in the leaves at harvesttime and the amount of color development of the fruit. It was evident that to obtain best color in the apples N applications should be as light as was consistent with satisfactory growth and yield. Trees that received N applications after leaf fall the preceding autumn developed high color in their fruit, but the N content of the trees was low suggesting a possible loss from the soil by leaching. Under the conditions of the experiment the addition of K was apparently without effect on color development.

Tree girth and yield as indicators of subsequent apple tree productivity, A. F. YEAGER and L. P. LATIMER (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 101-105; also [*New Hampshire Sta. Sci. Contrib.* 76 (1939)], pp. 101-105).—An analysis of yield and growth data taken on a block of Northern Spy with McIntosh fillers at Durham and in a McIntosh orchard near Pittsfield revealed many correlations that might be useful in estimating future yields of the trees. Girth proved to be a fairly good measure of the average productivity of trees in the succeeding 2 yr., but was not so accurate for estimating yield of each of the 2 yr. The average yield for any 2 yr. was correlated closely with average yield in succeeding years. Attempts to utilize both girth and yield by the multiple correlation technic proved effective, but this method was very little better than that of average yield alone. Selection of a group of the more uniform trees, based either on growth or yield, resulted in considerably smaller coefficients of variability.

Catalase activity and nitrogen content of apple buds in relation to advance in season, A. J. LOUSTALOT. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 363, 364).—In lateral buds collected at different intervals from February 16 to May 8 from 1- and 2-year-old shoots of 18-yr. McIntosh trees there was noted little or no change in catalase activity until March 27, when there was a marked increase which continued until the last sampling date. Nitrogen content showed no appreciable change until April 20, with a continued rise thereafter. A gain in catalase activity preceded any apparent change in dry weight and nitrogen content of the buds.

Catalase activity in relation to after-ripening of apple seeds, A. J. LOUSTALOT. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 361, 362).—Parts of two lots of McIntosh apple seeds, one of which had been kept dry in an open container at room temperature for 1 yr. and the other freshly extracted from the fruit, were afterripened in damp peat moss at a temperature of 32°-36° F. Catalase determinations after removal of the seed coats showed little or no change in the nonafterripened lots of both ages. The afterripened seeds showed a gradual increase in enzyme activity, accompanied by increased germinability. At the last sampling date, 85 days following afterripening, the old and the fresh seeds were about alike in catalase activity. The older seeds seemed to yield a somewhat higher and earlier germination than did the fresh seeds.

Cover crops and fertilizers for Georgia peach orchards, E. F. SAVAGE (*Georgia Sta. Cir.* 122 (1940) pp. 10, figs. 2).—Pointing out the potential value of cover crops, the author warns that certain kinds of cover crops may compete seriously for water and thereby injure the peach trees. Winter types, such as rye and vetch mixtures, Austrian Winter peas, and crimson clover, are desirable

because they grow in the season of abundant moisture. Lespedeza is also valuable because it makes its greatest growth in late summer and early autumn when the tree has less need for water. Information is given as to contour planting of trees, fertilizers and their use, and the effect of fertilizers on the fruit.

The phosphate nutrition of fruit trees.—II, Continued response to phosphate applied at the time of planting, O. LILLELAND and J. G. BROWN. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 53-57, figs. 2).—This second contribution (El. S. R., 76, p. 334) discusses the results of three treatments applied to Elberta peach trees planted in March 1937—(1) no fertilizer, (2) 10 lb. of treble superphosphate in the planting hole, and (3) the same as (2) plus $\frac{1}{2}$ lb. of ammonium sulfate. Part of the trees were dug in February 1938 and part in December 1939. Definite response to N was evident in June 1937 and to phosphate in July 1937. At the end of the first growing season the trees receiving phosphate and phosphate plus N were 245 and 322 percent larger, respectively, than the no-fertilizer trees. At the end of three growing seasons the percentages were 107 and 138, respectively, despite no further fertilization. Leaf symptoms of P deficiency did not appear in the no-fertilizer trees, but analyses of the leaves did show a marked increase in the P content during the first season, and only slight increments in the second and third seasons.

Studies on the use of certain dinitrophenol compounds to break the rest period in peach trees, J. H. WEINBERGER. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 353-358, figs. 2).—Of some 25 chemicals tested in Georgia as agents for breaking the rest period of peach trees, only 1, dinitrophenol, compared favorably with dinitro-*o*-cyclohexylphenol in effectiveness. Most of the materials proved no more effective than the oil emulsion carrier used alone. The time of application of rest-breaking chemicals was found highly important, with the optimum date varying widely with variety, latitude, and the severity of the winter. The optimal time extended apparently over only a few days and was governed by the number of hours of low-temperature (below 45° F.) exposure that the trees endured prior to treatment. In the orchard trials, chemical treatments appeared to be equivalent to 200-300 hr. of low-temperature exposure. The farther south that peaches are grown, the more significant was the rest-breaking treatment.

Summer pruning of peach trees in the nursery row, W. H. UPSHALL. (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 343, 344).—Over a 3-yr. period no significant differences in trunk or height growth were noted in peach budlings whether the lower laterals were removed at weekly or biweekly intervals or once in September. However, frequent removal of laterals gave a smoother trunk with better-healed wounds.

Peach spraying experiments, 1938-1939.—Progress report, H. W. THURSTON, JR., and H. J. MILLER (*Pennsylvania Sta., Jour. Ser. Paper 952* (1940), pp. [1]+16).—This is a condensed report in mimeograph form.

A quantitative survey of eight mineral elements by a spectrographic method and of total nitrogen in young leaves of twenty-five varieties of American grapes, B. C. BRUNSTETER, A. T. MYERS, I. W. DIX, and C. A. MAGOON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 635-638).—The second leaves from the base of new thrifty shoots, after drying and grinding, were analyzed spectrographically for K, Mg, Ca, P, Al, Fe, Mn, Cu, and N. Outstanding differences were determined in the mineral and nitrogen contents of the different varieties, the differences in some instances amounting to 100 percent or even several hundred percent. Marguerite was characterized by a high content of Al, Fe, and Mn; Niagara by a low content of K and Ca; Massasoit by a low content of Mg and Mn; and Caywood No. 50 and Columbia Imperial by

a high N content. In Lindley and Marguerite only was the Fe content higher than that of the Mn. The biological significance of the findings is not discussed.

Rootstocks for the Oriental persimmon, R. W. HODGSON. (Univ. Calif.) (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 338, 339).—Propagated on *Diospyros lotus*, *D. kaki*, and *D. virginiana*, Hachiya trees made their largest growth on *D. lotus* and their smallest on *D. virginiana*. Fuyu trees made their greatest growth on *D. virginiana* and their least on *D. lotus*. In general, *D. kaki* exhibited the widest range of compatibility with Oriental persimmon varieties and may prove the most desirable stock.

Fertilizer investigations with the Gros Michel banana, H. H. CROUCHER and W. K. MITCHELL (*Jamaica Dept. Sci. and Agr. Bul.* 19, n. ser. (1940), pp. [1]+30, figs. 11).—Stating that there is a paucity of published information relating to fertilizer studies of bananas and that the available data suggest that N is the most important limiting element, the authors discuss experiments with the Gros Michel variety in Jamaica. The results varied greatly with the type of soil involved. On a soil derived from Richmond Beds, favorable effects were secured only from N. On a soil derived from calcareous deposits of the Bowden Beds, benefits were secured from N, P, and K. On a soil of the Terra Rossa type, P proved the limiting factor, but when this element was supplied adequately K also became beneficial. On another soil of the Terra Rossa type, no yields were secured in the absence of applied K, and doubling the K fraction further increased yields. There was an apparent correlation between vigorous growth and yield. An excess of P without an increase in K resulted in short-fingered fruits and distortion of the fingers.

Investigation on the development of color in citrus fruits, E. V. MILLER and J. R. WINSTON. (U. S. D. A.). (*Fla. State Hort. Sci. Proc.*, 52 (1939), pp. 87-90).—Stating that there are two types of ether-soluble pigments in orange rinds, namely chlorophylls and carotenoids, the authors assert that degreening on the tree results in a loss of chlorophylls and an increase in carotenoids. Degreening by the use of ethylene tended to remove chlorophyll without increasing the carotenoids. Limes, lemons, and grapefruit differed somewhat from oranges in that carotenoid pigments tended to decrease along with chlorophyll as the fruits lost green color whether in the normal ripening process on the tree or when treated with ethylene.

Seasonal variation in juice and acid content of Persian limes, S. J. LYNCH. (*Fla. Expt. Sta.*). (*Fla. State Hort. Soc. Proc.*, 52 (1939), pp. 81-83).—Top-grade fruit obtained at 2-week intervals from packing houses was found to contain 50 percent or better of juice, except for one picking in June and one in December when there was a slight decline. Peaks occurred in August and early September and again from the middle of October to the middle of December. Acid content of the juice was more constant, with a range from 5.37 to 6.13 percent. The largest fruits were picked during November and December.

Gardenia culture, G. E. YERKES, F. L. MULFORD, L. McCULLOCH, and F. F. SMITH (*U. S. Dept. Agr. Leaflet* 199 (1940), pp. 8).—In compiling general information, the authors discuss the cultural requirements in the field, greenhouse, and home and the control of various physiological, pathological, and entomological conditions.

The culture and forcing of Easter lilies, H. E. WHITE (*Massachusetts Sta. Bul.* 376 (1940), pp. 20, figs. 5).—Presenting general information relating to the horticultural importance of lilies, foreign and domestic production of bulbs, culture, propagation, fertilization, temperature requirements for growth and physiological, pathological, and entomological problems, the author discusses

the results of certain experiments. The removal of from 20 to 25 scales from 7- to 9-in. bulbs reduced the vitality of the plants. Lilies grew equally well in soils with and without the addition of amendments of such materials as manure, peat, and sand. *Lilium longiflorum giganteum* bulbs rooted better at temperatures above than below 60° F., and the rooting temperature influenced the subsequent rate of stem development. Lilies rooted at from 80° to 82° and from 52° to 55° required approximately 100 days and from 140 to 150 days, respectively, to bloom. Bulbs rooted at from 60° to 70° produced slightly more blooms than those rooted below 60°. The 8- to 10-in. bulbs bloomed approximately 20 days earlier than the 7- to 9-in. bulbs. Erabu lilies bloomed 16 days earlier and produced more blooms per plant when rooted and grown at from 62° to 65° than at from 52° to 55°. Supplemental lighting was effective in hastening the blooming of Easter lilies, and cut blooms were held successfully for a period of 8 weeks in storage at from 38° to 40°.

Light and heat intensity not explanation of fading of rose blooms: Pruning, defoliation, carbohydrates are factors, J. C. RATSEK. (Tex. Expt. Sta.). (*South. Florist and Nurseryman*, 50 (1940), No. 11, pp. 3, 4, figs. 2).—Where Talisman roses were pruned to 4-, 12-, and 20-in. heights there was noted a great difference in the color of the blooms of the first crop. The petals of the blooms of the 4-in. plants were almost white, while those of the less severely pruned plants showed more and more of the normal color. Unpruned plants produced deep-red blooms of the true Talisman form. Where stems were completely defoliated, within 4 days the developing blooms were white to pale pink. The application of a sugar solution to the defoliated plants improved the color. By defoliating plants to different degrees and controlling the number of blooms it was possible to produce a whole range of colors. It is concluded that carbohydrate supply is concerned with development of color, and light intensity is also a factor.

The ferns and related plants native to North Dakota, O. A. STEVENS (*North Dakota Sta. Bimo. Bul.*, 3 (1940), No. 2, pp. 13-15, figs. 3).—Descriptive notes are presented on a number of ferns and related plants.

Coniferous tree seed testing and factors affecting germination and seed quality, C. E. HETT and E. J. EKLASON (*New York State Sta. Tech. Bul.* 255 (1940), pp. 45, figs. 8).—Based on studies with 34 different species of conifer seed, the authors report that the various species have characteristic requirements for successful germination. Mature, well-filled seeds freshly collected and extracted properly should be practically 100 percent viable, and any material reduction from this figure suggests improper handling during collection, extraction, and storage. In the study, average germination percentages varied greatly with genera and species. Most of the pines were between 70 and 90 percent viable, while larch seed seldom gave over 50 percent. Moist prechilling was found essential for certain pine and larch species and for eastern hemlock, and may be desirable for other species. Daylight was necessary for satisfactory germination of some species, and artificial light may be helpful in securing complete germination in certain Scotch pine stocks. Temperature and moisture were critical factors in the germination of some species, and alternating or cool temperatures were more stimulating to the dormant seed than were constant or high temperatures. Pine seed had longer life in ordinary dry storage than did other genera. The ideal long-time storage for all conifer seeds was in sealed containers at a temperature of about 2°-4° C., and with a moisture content not exceeding 5-8 percent.

FORESTRY

The Society of American Foresters—an historical summary, R. S. Hosmer (*Jour. Forestry*, 38 (1940), No. 11, pp. 837-854).—This historical summary by a charter member covers the 40 yr. of life of the society during which the membership has increased from 7 to 4,600, distributed in 19 sections of the United States and Canada.

[Forestry studies by the New Haven Station] (*Connecticut [New Haven] Sta. Bul.* 438 (1940), pp. 509-511, 513).—Brief reports are presented on the salvaging of lumber destroyed by the hurricane in the Rainbow Forest, measurements on fallen timber, preservative treatment of fence posts and other wood products, and the distribution of forest planting stock.

Forestry [studies by the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 399 (1940), pp. 27-29).—Brief reports are presented on studies of the distribution of trees by diameter classes in virgin timber stands, by H. A. Meyer and D. D. Stevenson; the value of different chemicals for killing "weed" trees, by Stevenson; and factors affecting the sugar content of maple sap, by Stevenson and H. O. Triebold.

Forestry on private timberlands (*U. S. Dept. Agr., Misc. Pub.* 381 (1940), pp. [25], figs. 80).—This is a pictorial record, with annotations, of what some private timberland owners in the United States are doing to keep their forest lands in a productive condition.

Simple method for determination of range distance, R. R. PATON and Z. W. WHITE (Ohio Expt. Sta.). (*Jour. Forestry*, 38 (1940), No. 10, pp. 818, 819).—Herein is outlined a simple method based on triangulation for determining horizontal distances.

The viability and collection of seed of *Liriodendron tulipifera* L., R. E. WEAN and A. T. GUARD. (Purdue Univ.). (*Jour. Forestry*, 38 (1940), No. 10, pp. 815-817, fig. 1).—Discussing seed formation in the tulip tree, the authors report that in examining a total of 11,161 samaras collected from cones from 7 trees only 19.08 percent were found to contain endosperm. This suggested that some 81 percent of the embryos had apparently aborted following fertilization. There appeared to be no significant variation in the number of seeds per cone or in the number of embryos developed from cones collected at different heights from the trees. The individual trees differed in the percentage of viable seeds per cone, suggesting the desirability of examining sample cones from a given tree prior to harvesting the fruits for seeding purposes. It is suggested that a transverse cut through the middle of a cone will indicate the value of the parental tree as a source of seed.

Multiple seedlings of pines and Douglas fir, A. R. GRAYAT, D. H. LATHAM, L. W. B. JACKSON, G. Y. YOUNG, and W. C. DAVIS. (U. S. D. A. et al.). (*Jour. Forestry*, 38 (1940), No. 10, p. 818, fig. 1).—A record is presented of the frequency of occurrence of multiple seedlings in *Pinus banksiana*, *P. ponderosa*, *P. resinosa*, *P. sanderogeri*, *P. strobus*, and *Pseudotsuga taxifolia*. (= *P. douglasii*).

Propagation of white pine by cuttings, W. L. DORAN, R. P. HOLDSWORTH, and A. D. RHODES. (Mass. Expt. Sta.). (*Jour. Forestry*, 38 (1940), No. 10, p. 817).—Cuttings taken in March from the upper and lower portions of a tree about 80 yr. old were treated variously with indolebutyric acid and sucrose and placed in a sand-peat moss bed in a warm greenhouse. At the end of 3 mo. the untreated controls were mostly dead, but the cuttings which had been given a preliminary treatment with sucrose and a final treatment with a solution of 50 mg. of indolebutyric acid per liter of water had rooted 20 percent

in the case of cuttings from the lower part of the tree and 10 percent in those from the upper portion. Cuttings treated with sucrose prior to the indolebutyric acid treatment lived longer, rooted or not, than did those treated with the acid alone.

Effect of high rate fertilizer treatments of nursery stock upon its survival and growth in the field, S. A. WILDE, R. WITTENKAMP, E. L. STONE, and H. M. GALLOWAY. (Wis. Expt. Sta. et al.). (*Jour. Forestry*, 38 (1940), No. 10, pp. 806-809, figs. 2).—The application by broadcasting or in solution of a balanced NPK fertilizer to nursery beds of average fertility resulted in an average increase in survival of from 10 to 15 percent following transplanting of 2-year-old jack, red, and Scotch pine seedlings to a podzolic outwash sandy loam. However, no statistical significance could be attached to survival data because of the variability among individual sample plats. The average increase in height growth ranged from 20 to 30 percent in favor of the fertilized stock and was found statistically significant. A seasonal effect was evident, with spring planting giving somewhat better survival and height growth than did fall planting.

A new method of pruning, B. H. PAUL and S. A. WILDE. (U. S. D. A. and Univ. Wis.). (*Jour. Forestry*, 38 (1940), No. 10, pp. 819, 820, fig. 1).—A Russian method of disbudding the lateral shoots from the leader so as to secure a branchless trunk of from 6 to 7 m. in length is described. During the process, some of the lower laterals are allowed to remain to nourish the branchless leader.

The role of soil organic matter in reforestation, S. A. WILDE and W. E. PATZER. (Wis. Expt. Sta. et al.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 8, pp. 551-562, figs. 7).—In studies conducted in Wisconsin there was noted a pronounced increase in the rate of height growth of *Pinus banksiana* and *P. resinosa*, correlated with a higher content of organic matter in the soil. A close relationship was established between the content of organic matter and that of total N, available P, and available K in outwash and pitted outwash sandy soils derived from granitic rocks. There was noted a general tendency for the increased survival of seedlings on soils high in humus, but the correlation was not significant.

The effect of a compact subsoil horizon on root penetration, D. I. CROSSLEY. (Minn. Expt. Sta.). (*Jour. Forestry*, 38 (1940), No. 10, pp. 794-796, figs. 2).—Under conditions prevailing in central Minnesota, permanently compacted subsoils restricted rooting mainly to the superimposed soil horizons, with the degree of confinement depending on the degree of compaction. The irregular growth habit exhibited by the roots of bur oak growing under normal soil conditions is attributable to hereditary characteristics rather than to any external factors. It was evident that the uniformity in the position and size of the structural elements in the roots of the bur oak make it impossible to distinguish any seasonal growth periodicity.

Tested methods of grafting pines, N. T. MIROV. (U. S. D. A. and Univ. Calif.). (*Jour. Forestry*, 38 (1940), No. 10, pp. 768-777, figs. 3).—In grafting experiments, pines belonging to rather widely distant groups were successfully united. On the basis of the 15 species employed, it appeared possible to intergraft any of the species. Treatment of the grafted seedlings with colchicine tended to increase survival. Shoots of older trees were grafted successfully on young transplants, and needle bundles of ponderosa and Coulter pines were grafted successfully. Inarching was found the most successful method for grafting pines under the semiarid conditions of California summers. The value of the findings for experimental work is emphasized.

Shade effects in ponderosa pine, G. A. PEARSON. (U. S. D. A.). (*Jour. Forestry*, 38 (1940), No. 10, pp. 778-780, figs. 2).—In experiments with seedlings and transplants grown under lath shades of different densities and with root competition eliminated, it was found that "ponderosa pine does not develop normally in the Southwest if overhead cover intercepts as much as half of the insolation. Side shade improves the form and is, on the whole, beneficial if the tree receives full sunlight from above during most of the day. Sapling and pole stands, even under dense stocking, need the side shade of larger trees in order to develop a form suitable for saw timber."

Forest products statistics of the Northeastern States, R. V. REYNOLDS and A. H. PIERSON (*U. S. Dept. Agr., Statis. Bul.* 70 (1940), pp. 109, figs. 3).—This, the fifth in a series of six bulletins planned to cover the entire United States (E. S. R., 82, p. 494), presents statistics for 11 Northeastern States and the District of Columbia. The subjects covered include lumber production, distribution, and consumption; pulpwood consumption; and stumpage, log, and lumber prices.

DISEASES OF PLANTS

Bureau of Plant Pathology, D. G. MILBETH (*Calif. Dept. Agr. Bul.*, 28 (1939), No. 10, pp. 567-577).—Included are brief reports of work with western celery mosaic, bacterial ring rot of potato, peach mosaic eradication, decline disease of date palm, white pine blister rust, vetch disease of unknown cause, chestnut blight eradication, Pierce's disease of grapevines, European grape diseases, crown gall, crinkle disease of cherry, a disease of *Pittosporum tobira* suggestive of virus etiology, bud shattering of almond, Winters disease of peach, a new peach trouble resembling the "X" disease, and a summary of causes of plant diseases on specimens received during 1939.

[Plant disease work by the New Haven Station]. (Partly coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul.* 438 (1940), pp. 511-513, 516-520, 528).—Progress reports are included on white pine blister rust and Dutch elm disease control; new copper compounds for downy mildew of cucumber and cantaloup; new sprays and schedules for defoliation diseases of tomato and other vegetables; new squash foot rot due to *Fusarium* sp.; studies of "X" disease of peach; apple spraying for cedar rust, scab, and insect pests; foliar nematode on chrysanthemums; and seedbed control of tobacco downy mildew.

Some recent records of plant pathogens in Missouri, W. E. MANEVAL (*Univ. Mo.*). (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rpt.*, 1940, Sup. 125, pp. 151-164).—This annotated list supplements one previously noted (E. S. R., 78, p. 809), and contains numerous new records of pathogens on wild and crop plants, nearly half of the fungi being new reports for Missouri and most of the others being new host records. There are 50 references.

[Plant disease work by the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 399 (1940), pp. 23, 24, 47, 65).—Brief progress reports by W. S. Beach, J. J. Reid, D. E. Haley, H. W. Thurston, Jr., and D. E. H. Frear are included on tobacco leaf spot diseases (*Pseudomonas fluorescens* and *Bacterium tabacum*) and their control; specific gravity of commercial and home-boiled lime-sulfur fungicides; and *Trichoderma* spp., *Diplocladium* spp., and *Conidiobolus villosus* in relation to mushroom diseases and their control.

[Papers of interest to phytopathology] (*Assoc. Off. Seed Anal. North Amer. Proc.*, 31 (1939), pp. 116-127, figs. 5).—The following are of interest: Influence of Chemical and Thermal Treatments on Infection of Cruciferous Seedlings by *Alternaria* spp. and *Rhizopus nigricans*, by W. Crosier and S. Patrick (pp. 116-120), and Some Fungi Associated With Grass Seed, by W. Crosier and D. E.

Weumer (pp. 120-124) (both N. Y. State Expt. Sta.); and The Hemocytometer Method for Detecting Fungus Spore Load Carried by Wheat Seeds, by W. N. Rice (pp. 124-127) (Iowa).

Mycological notes [trans. title], J. B. MARCHIONATTO (*Physis*, 15 (1939), No. 47, pp. 133-144, pls. 9).—Descriptions and local notes on 27 species of fungi of phytopathological interest.

[Proceedings of Central New York Branch of the Society of American Bacteriologists] (*Jour. Bact.*, 40 (1940), No. 1, pp. 165, 166, 168, 169).—Abstracts of the following papers of interest to plant pathology are included: The Selective Disinfection of Seeds, by H. S. Hamilton and A. W. Hofer (N. Y. State Expt. Sta.); and Seed-Bed "Sterilization" and Tobacco Wildfire, by J. Naghski, D. E. Haley, and J. J. Reid (Pa. Sta.).

A review of latent infections caused by *Colletotrichum gloeosporioides* and allied fungi, R. E. D. BAKER, S. H. CROWDY, and R. K. MCKEE (*Trop. Agr. [Trinidad]*, 17 (1940), No. 7, pp. 128-132, figs. 3).—The object of this review (17 references) is to summarize existing data on this and allied species of *Colletotrichum*, and to indicate problems still requiring elucidation.

The genus *Fusarium* in Argentina [trans. title], C. J. M. CARRERA (*Physis*, 15 (1939), No. 47, pp. 21-77, figs. 24).—A general and taxonomic study, discussing the genus, its importance from the standpoint of plant infections, the types of lesions induced, pathogenicity, culture studies and media, keys to the generic groups, and detailed treatment and illustrations of the specific groups and species. Three pages of references are included.

Argentine species of *Peronospora* [trans. title], J. C. LINDQUIST (*Physis*, 15 (1939), No. 47, pp. 13-20).—A taxonomic study of this plant-parasitic fungus genus.

A quick method of isolating certain phycomycetous fungi from soil, C. H. MEREDITH. (Iowa Expt. Sta.). (*Phytopathology*, 30 (1940), No. 12, pp. 1055, 1056).—Phycomycetous fungi were isolated by touching the soil on a flamed cover slip to the surface of an inverted Petri dish of nutrient-free agar. The tip of the most rapid-growing organism was freed from bacteria by placing it under nutrient-free agar in a Petri dish and removing the fungus when it grew to the surface. Cultures of *Pythium debaryanum*, *P. ultimum*, *P. rostratum*, *P. echinulatum*, *P. pulchrum minden*, and *P. vexans* were identified in northern Iowa, and of *P. debaryanum*, *P. pulchrum*, and *P. rostratum* in southern Iowa.

Morphogenetic aspects of virus diseases, M. SHAPOVALOV. (U. S. D. A. and Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters, Proc.*, 16 (1938-39), pp. 55-58, pl. 1).—The author concludes from this review that systemic viruses can alter the normal morphology of plants, that these morphogenic effects may be either depressive or stimulative, that many of the morphological changes are teratological, and that the induced malformations may furnish valuable material to experimental morphology. Some of the virus-induced morphogenic changes in plants have been used for practical purposes in ornamental horticulture, and the possibilities of further developments along such lines are noted.

Acquired immunity from plant virus diseases, W. C. PRICE (*Quart. Rev. Biol.*, 15 (1940), No. 3, pp. 338-361, figs. 5).—A critical review (118 references).

The value of testing fungicides in the laboratory before use in the field, F. L. HOWARD. (R. I. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 409-414).—Tested on glass slides, bordeaux mixture at full or half strength almost completely inhibited germination of the peach brown rot fungus. Commercial brands of "dry" bordeaux and of certain "insoluble" copper fungicides when used at the recommended dilution proved inferior to bordeaux, but some of them

at double strength approached it in effectiveness. Liquid lime-sulfur 2-100 proved slightly more toxic than 1-100 dilution, but somewhat less so than bordeaux. A wide range in the efficiency of commercial dry lime-sulfurs was found. Many of the "wetttable" sulfurs and the sulfur dusts exhibited a relatively low toxicity. An apparent sharp reduction in the toxicity of bordeaux to *Alternaria solani* spores occurred at dilutions greater than 5-5-50, and certain dry bordeaux preparations failed to check germination materially. Less fungicidal potency of some chemicals was evident on the living leaf than on glass. A small amount of wheat flour increased the effectiveness of some fungicides. Some insoluble coppers and liquid lime-sulfur had little effect on the spore germination of the tomato early blight fungus. Malachite green and some other organic dyes at great dilutions were potent against *A. solani* spores. Caution in selecting adjuvants is advised, since some combinations render the fungicide practically innocuous.

A rapid method of testing the effects of fungicides on fungi in culture, B. W. HENRY and E. C. WAGNER. (Univ. Wis.). (*Phytopathology*, 30 (1940), No. 12, pp. 1047-1049, fig. 1).—Dusts or sprays are applied directly to Petri dish cultures, from which a preliminary estimate of the fungicidal value of compounds is obtained.

Silver as a fungicide, L. W. NIELSEN and L. M. MASSEY. (Cornell Univ.). (In *Silver in Industry*, edited by L. EDDICKS. (New York: Reinhold Pub. Corp., 1940, pp. 431-450).—The text includes the toxicity of silver to plants, plant organs, and plant pathogens; and silver as a protective fungicide, seed disinfectant, and soil disinfectant.

Host specialization in the head smut of grasses, *Ustilago bullata*, G. W. FISCHER. (Wash. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 30 (1940), No. 12, pp. 991-1017, figs. 2).—Cross-inoculation studies (1936-39) with 44 collections of *U. bullata* (including *U. bromicora* and *U. lorentziana*) from 36 species of *Agropyron*, *Bromus*, *Elymus*, *Festuca*, *Hordeum*, and *Sitanion* are presented. Eight physiologic races were recognized by the reactions of 14 differential species selected from the many inoculated. The supposed specialization of the smut from *Agropyron* and *Hordeum* spp. to grasses of the Hordeae and of the smut from *Bromus* spp. to grasses of that genus was found untenable. Certain collections from *Agropyron* and *Elymus* spp. proved virulent on *Bromus* spp., and certain collections from *Bromus* spp. proved virulent also on *Agropyron*, *Elymus*, and *Hordeum* spp. Five of the 8 races have highly susceptible hosts in both the brome-grasses and the Hordeae. The most common race, widespread in the Pacific Northwest on *B. tectorum*, proved capable of infecting a number of species of *Agropyron*, *Elymus*, and *Festuca*, as well as a few other *Bromus* species. Of the economic grasses, the most susceptible to this race of *U. bullata* is *E. glaucus*. Another race also common in the Northwest on the weed *B. mollis* is virulent on *E. canadensis*, also an economic species. The author's earlier recommendation that *U. bullata*, *U. bromicora*, and *U. lorentziana* be consolidated on morphological grounds is now fully substantiated by the fact that they are not even separable on a host specialization basis. The recognition of each physiologic race as a species is considered undesirable. Instead, the 8 races are given numbers, in accordance with the common practice of designating physiologic races in the rusts and smuts.

Variability in association effects of other soil fungi on the virulence of *Helminthosporium sativum* on wheat seedlings, G. B. SANFORD and M. W. COMBACK (*Canad. Jour. Res.*, 18 (1940), No. 11, Sect. C, pp. 562-565).—"Random isolates of *Penicillium*, *Actinomyces*, and certain miscellaneous soil-inhabiting fungi were tested in steam sterilized soil, under pure culture conditions, for their association effects on the virulence of *H. sativum* P. K. and B. on wheat

seedlings. Certain isolates of the first two genera mentioned exerted a marked degree of suppression, some had no effect, while others increased the virulence. Similarly, these effects varied widely within certain species of *Penicillium*. This preliminary study indicates that the random isolates of many genera and species of fungi may differ widely in ability to affect the virulence of certain plant pathogens."

Airplane spore traps for studying the annual migration of wheat rust, K. S. CHESTER. (Okla. A. and M. Col.). (*Okla. Acad. Sci. Proc.*, 19 (1939), pp. 101-104).—The additional evidence presented on the long distance movement of the rust diseases of wheat is believed to bring further indication that the rust problems are not purely local. Ultimate control must depend on the widespread use of resistant varieties.

The control of truck crop diseases in Tidewater Virginia, H. T. COOK and T. J. NUGENT (*Virginia Truck Sta. Bul.* 104 (1940), pp. 1661-1717, fig. 1).—The purpose of this bulletin is to furnish the truck crop growers of this region with definite programs for controlling the important diseases of the vegetable crops grown there. These programs are not necessarily applicable in other parts of Virginia or in other States. Part 1 considers the importance of vegetable diseases and the nature, causes, and methods of controlling plant diseases; part 2, disease control programs for specific crops; and part 3, the preparation and use of fungicides.

The effect of some mineral nutrients on the development of clubroot of crucifers, D. E. PRYOR. (Wis. Expt. Sta. et al.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 2, pp. 149-160, figs. 4).—Methods are reported for securing effective clubroot infection in sand culture. The plants were grouped into those with no symptoms, those with clubs, and those with galls. The clubs were of the usual type mentioned by other workers. The effect of S, N, and K nutrition on the development of clubroot in susceptible, resistant, and immune crucifer strains was studied, the proportions of nutrients being adjusted to produce plants with deficiency symptoms, plants growing moderately, and plants pronouncedly vigorous from an extra supply of N and K.

The percentage of susceptible plants with clubs was in general increased slightly over that in the complete solution by an abundance of K, more by an abundance of N, and most by the absence of S or N. The percentage was decreased markedly in plants deficient in K. A smaller proportion of susceptible plants developed galls in nutrient solutions with S or N withheld than was the case with resistant plants. The percentage of resistant plants with clubs was increased somewhat by high N, but it was greatest in the cases of S or N deficiency. With an extra amount of K the results were inconclusive. The proportion of plants with clubs was decreased definitely by lack of K. Gall formation was usually increased by the absence of S or by high N and was generally decreased by high or low K. No signs of clubroot appeared regardless of the variation in nutrient supply on the immune Purple Top Milan turnip. Deficiency of S lowered the S oil content greatly, while N starvation did not. On a given variety, the number of plants with clubs was increased to about the same extent by the absence of either of these elements. It would thus appear that S oils are unessential in preventing or retarding clubroot development in its tissues.

Agglutination test applied to strains of *Phytophthora stewartii*[1], G. L. McNEW and A. C. BRAUN (*Bot. Gaz.*, 102 (1940), No. 1, pp. 64-77).—Three of the 90 single-colony isolates studied failed to agglutinate in either of 2 serums used, some in one or the other but not in both, and the remainder in both serums at dilutions of 1:20 to 1:2,560. No consistent serological properties of isolates

from susceptible v. resistant inbred lines of corn were noted. Some isolates from the same leaf lesion were as different from one another as those from different plants. Strains from the same culture were found to differ in serological characters. Study of 15 strains showed that the serological properties were not correlated with any particular colony character, physiological ability, or degree of virulence. Strains from different localities in the United States and Mexico proved no different from one another than some of the variants derived from one of the strains. Some strains agglutinated in all serums as high as 1:1,280 to 1:5,120. These strongly agglutinating strains usually induced immune serums that failed to agglutinate 5 of the strains. The poorly agglutinating strains, on the other hand, produced serums that were effective against all the cultures tested. Several other species of wilt-inducing bacteria failed to agglutinate in antiserum for 3 strains of *P. stewartii*. There are 28 citations to the literature.

Agglutinin absorption by different strains of *Phytomonas stewartii*[i], A. C. BRAUN and G. L. McNEW (*Bot. Gaz.*, 102 (1940), No. 1, pp. 78-88).—Strains of *P. stewartii* differing in virulence, colony type, physiology, and agglutination reaction were tested for ability to absorb agglutinins from immune serums. All strains tested absorbed most of the agglutinins from both homologous and heterologous serums, showing that they were similar in most essentials. The failure of some strains to agglutinate after absorbing agglutinins appeared to be due to their resistance to this reaction. Some differences were noted between the strains from Mexico, New York, and New Jersey. The differences in serological properties were not closely correlated with any other character observed, such as virulence or colony type.

Studies of the etiological agent (*Phytomonas malvacearum*) of angular leaf spot of cotton in Argentina [trans. title], L. HALPERIN (*Physis*, 15 (1939), No. 47, pp. 99-102, fig. 1).—This is a preliminary report.

The susceptibility of cotton seedlings to *Phymatotrichum omnivorum*, L. M. BLANK (Tex. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 30 (1940), No. 12, pp. 1033-1041, fig. 1).—Under favorable conditions, infection of cotton seedlings from inoculation with sclerotia occurred to a greater extent with older than with very young seedlings. Inoculation at time of planting resulted in a longer incubation period and a much lower percentage of disease than did inoculation at 10 days or more after germination of the seed. Carbohydrate accumulation in the seedling tissues at approximately the time of a sharp increase in susceptibility to infection suggests the importance of the host-parasite nutritional relationship. Addition of starch to autoclaved soil or to an agar substrate increased the virulence to such an extent that seedlings were readily infected immediately after germination.

Sodium hypochlorite shows promise as a seed treatment, R. WEINDELING (U. S. D. A. and S. C. Expt. Sta.). (*Phytopathology*, 30 (1940), No. 12, pp. 1051, 1052, fig. 1).—Considerable control of damping-off of cotton due to *Glomerella gossypii* was obtained by treating seed with a commercial sodium hypochlorite preparation (B-K) at 1.5-4 oz. per bushel. The practical possibilities of such treatment are suggested for use where metallic germicides are undesirable.

Pea seed treatment with chemical dusts, J. C. WALKER, E. J. DELWICHE, and P. G. SMITH. (Wis. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 2, pp. 143-147).—In 4 years' trials of red copper oxide and 2 percent Ceresan in Wisconsin, the benefits varied with season and location. Soil conditions inducing stand reduction of sugary-cotyledoned varieties were not detrimental to the starchy-seeded Alaska variety, and the latter was thus not benefited by seed treatment. There were significant increases in only 1 of 4 yr. at

Marshfield, and then only with red copper oxide. During a 2-yr. period, more consistent beneficial results were obtained by seed treatment at Sturgeon Bay than at Madison. In a majority of cases for all tests the increased stand was greater with red copper oxide. There was no clear correlation between soil moisture and effectiveness of treatment.

Anthracnose of black pepper (*Piper nigrum* Linn.), Y. Y. VIMUKTAN-ANDANA and M. S. ORLINO (*Philippine Agr.*, 29 (1940), No. 2, pp. 124-141, figs. 5).—This reports a general study of a minor disease due to *Glomerella cingulata*, including the cultural characters of the fungus, climatic influences, and control.

Mildew or blight of peppers due to *Phytophthora capsici* in Argentina [trans. title], E. F. GONOR (*Rev. Facult. Agron. La Plata*, 24 (1939), pp. 235-280, pls. 7, figs. 2; *Eng. abs.*, p. 280).—This paper discusses the incidence and serious economic importance of the disease in Argentina; its symptoms, including fruit rot and killing of seedlings; characters of the fungus as isolated from stems, fruits, and seeds; its pathogenicity and seed transmission; the pathogenesis and epidemiology of the disease; and its control by soil disinfection, seed treatment, and spraying.

Potato naturally infected with California aster yellows, H. H. P. SEVERIN. (Calif. Expt. Sta.). (*Phytopathology*, 30 (1940), No. 12, pp. 1049-1051, fig. 1).—A newly discovered variety or physiological race of the aster leafhopper (*Macrostelus divinus*) recovered the virus of California aster yellows from a spontaneously infected potato plant and transferred it to healthy asters.

Bacterial soft rot of potatoes in southern Florida, G. D. RUEBLE (*Florida Sta. Bul.* 348 (1940), pp. 36, figs. 6).—As a result of an investigation (begun in 1936) of the causative factors in a bacterial soft rot often causing heavy losses in shipments of washed potatoes from southern Florida, the causal organism (*Erwinia carotovora*) was isolated and its pathogenicity proved. Development in the field is closely associated with rainy weather causing waterlogging of the soil; is favored by other diseases, particularly late blight; and, in transit or storage, is increased by washing the tubers and crating them while wet, without rapid drying. Infection may start in the presence of free moisture at cuts, bruises, or cracks and may be spread by contact. The bacteria may enter from wet soils through lenticels or lesions.

From laboratory tests using a specially constructed apparatus for maintaining temperature and humidity, it was found that rapid drying of the tuber surfaces before or soon after packing controlled the disease in storage or shipment. Ordinary air blasts from fans or blowers proved insufficient, but washed potatoes were dried without damage by 4 min. in air heated to 150° F. The effect of the heated air on the temperature of the tubers was considerably offset by the cooling effect of evaporation. Tested on a commercial scale since 1938, bacterial soft rot has failed to develop sufficiently to cause rejection of a single shipment from the packing houses using the method. Precooling washed potatoes after loading the car eliminated most of the decay in shipments, but this method proved more costly and less reliable. Washing tubers by spray jets was less conducive to rot development than washing in tanks. The desirability is stressed of planting seed pieces in well aerated soil, of controlling diseases of the growing crop with copper fungicides, and of reducing mechanical injuries in harvesting to a minimum.

Problems in breeding for disease resistance, D. REDDICK. (Cornell Univ.). (*Othron. Bot.*, 6 (1940), No. 4, pp. 73-77).—A discussion of potato (*Solanum tuberosum*) breeding for resistance to *Phytophthora infestans* by the use of *S. demissum*.

The reaction of sorghum varieties and hybrids to milo disease, L. E. MELCHERS and A. E. LOWE. (Kans. Expt. Sta.). (U. S. Dept. Agr., Bur. Plant

Indus., Plant Disease Rptr., 1940, Sup. 126, pp. 165-175).—This disease, also known as root, crown, and shoot rot of milo and *Pythium* rot of milo, is said to be of increasing economic importance in those States where it occurs. The reactions of a large number of sorghum varieties and hybrids to it are here presented.

The action of electrolytes on solutions of tobacco mosaic virus nucleoprotein (Marmor tabaci var. vulgare Holmes), R. J. BEST (*Austral. Jour. Expt. Biol. and Med. Sci.*, 18 (1940), No. 3, pp. 307-312, fig. 1).—The critical coagulation concentrations of a number of electrolytes for aqueous solutions of the pure virus nucleoprotein were determined at pH 7 and 80° C. The precipitating power of cations paralleled their valency. The virus was precipitated in the form of paracrystalline needles and fibers which retained their infectivity. The nature of the anion markedly influenced the precipitating power, a lyotropic series being evident. The order of effectiveness on a molar basis was $(NO_3)^- < (ONS)^- < I^- < Br^- < Cl^-$, succinate, acetate < phthalate < phosphate < oxalate < tartrate < malate < sulfate < citrate. Salicylates behaved anomalously and denatured the virus protein.

Stony pit of pears at Hood River, J. R. KIENHOLZ. (U. S. D. A.). (*Oreg. State Hort. Soc. Ann. Rpt.*, 31 (1939), pp. 21, 22).—A note summarizing the results of a survey and of studies of this virus disease in Oregon.

The "X" disease, or yellow-red virosis, of peach, E. A. WALKER. (Univ. Md.). (*Md. State Hort. Soc. Proc.*, 43 (1940), pp. 50-52).—A review, with 10 references.

Little leaf control demonstrations, O. T. MOWHORTER, W. W. LAWRENCE, and G. LEAB (*Oreg. State Hort. Soc. Ann. Rpt.*, 31 (1939), pp. 110-115).—A summary of the results of demonstrations of the past few years with zinc sulfate sprays in combination with boron and spreaders for controlling this disease in sweet cherry trees.

Checking fruit decay with ultraviolet lamps, E. R. DE ONG (*Blue Anchor*, 17 (1940), No. 9, p. 7).—An improved type of germicidal lamp has been recently developed which at short distances is said to be capable of killing both bacteria and the spores of fungi causing fruit decay.

Control of crown gall of raspberries, H. F. WINTER. (Ohio Expt. Sta.). (*Hoosier Hort.*, 22 (1940), No. 11, pp. 168-170).—Use of crown gall-free stock is advocated, to be secured through propagation by sucker plants selected as far away as possible from the parent plants and transferred to new crown gall-free soil each year for 4-5 yr.

Cultivation of bananas under shade for the control of leaf spot disease, C. A. THOROLD (*Trop. Agr. [Trinidad]*, 17 (1940), No. 11, pp. 213, 214).—*Cercospora musae* leaf spot, major factor in reducing banana exports from Trinidad from $\pm 170,500$ stems in 1937 to $\pm 66,500$ in 1939, is effectively checked by providing cocoa and immortal trees (*Erythrina* spp.) as overhead shade for the bananas. Undesirable characteristics render objectionable the use of the resistant Imperial College hybrid I. C. 2, and under Trinidad conditions spraying and dusting are considered economically impracticable although experimentally demonstrated as efficacious in Jamaica. It is recommended that the susceptible Gros Michel banana be grown under shade in spite of the resulting higher incidence of fruit scarring.

Melanose of citrus and its commercial control, G. D. RUEHLE and W. A. KUNTZ (*Florida Sta. Bul.* 349 (1940), pp. 54, figs. 7).—A study was begun in 1931 at the Citrus substation to obtain more information on the life history of *Diaporthe citri*, the fungus causing this important disease, and to develop more practical methods of control. The purpose of this bulletin is to present the known facts regarding the cause, factors influencing infection, and recommenda-

tions for avoiding losses in commercial groves. These data are discussed in detail. Abundant infection shortly after blooming results in severely blemished fruits, which are graded out at packing time. It was found that most of this melanose infection could be prevented by applying an efficient copper fungicide 2-3 weeks after petal fall, following a normal bloom. Single applications of 6-6-100 bordeaux spray have given better control than single applications of lower concentrations, especially under conditions of severe infection, but when infection is expected to be severe two spraying with a 3-3-100 formula at a 3- to 4-week interval are to be preferred. Several of the proprietary "insoluble" copper fungicides may be substituted for the bordeaux with nearly equal control, and insecticides compatible with bordeaux may also be used with them. Wettable or bentonite sulfurs appeared to be the most practical spreaders for use with post-bloom copper fungicides. They controlled mites and killed many scale crawlers when added at 5-10 lb. to 100 gal. of spray. Whenever efficient copper sprays are used for melanose, some extra spraying for scale will be necessary, and in most cases oil emulsions will be found most satisfactory. Certain precautions must be observed in applying the different sprays used in the recommended schedules if spray injuries are to be avoided, and modified schedules are suggested for special conditions. Keeping the trees reasonably free of dead wood by pruning in early or midspring is said to be a valuable supplement to spraying for melanose control.

Catalog of the bacteria and fungi of the coffee tree (*Coffea* spp.), J. GONÇALVES CARNEIRO and D. BENTO PICKEL (*Catálogo das bacterias e dos fungos do caféiro*. São Paulo: Sec. Agr., Indus. e Com. Estado São Paulo, 1940, pp. 184).

Mango anthracnose [trans. title], G. G. RADA (*Min. Fomento, Dir. Agr. y Ganaderia* [Peru], *Oir.* 50 (1939), pp. 7, pls. 2).—An informative leaflet on the disease due to *Glomerella cingulata*, including control.

Further studies on the comparative efficacy of bordeaux mixture, copper oxalate, and some other "insoluble" copper sprays for the control of walnut blight, P. W. MILLER (U. S. D. A.). (*Oreg. State Hort. Soc. Ann. Rpt.*, 31 (1939), pp. 127-132).—Continuing his studies (*E. S. R.*, 81, p. 535) of various fungicides for control of *Phytophthora juglandis* on Persian walnut, the author found that at a sufficiently strong concentration copper oxalate gave almost as good control (1939) as bordeaux mixture and without injuring the foliage, as is often the case with the latter. Yellow cuprous oxide, copper oxychloride, and copper acetate also caused no detectable injury and gave good control, whereas zinc ammoniacal copper silicate, brown cupric oxide, and a proprietary copper fungicide gave poor to fair control and were noninjurious.

What can be done about lily mosaic? P. BRIERLEY. (U. S. D. A.). (*Amer. Lily Yearbook*, 1940, pp. 10-19, figs. 4).—The author attempts to define the lily mosaic problem in some detail, to weigh more recently discovered information, and to consider what lines of procedure are likely to control the disease satisfactorily in garden lilies. The discussion includes the new evidence and new views on lily mosaics, their prevalence in garden lilies, the wild host and latent virus hazards, and two possible methods of control—growing virus-free lilies from seed or use of varieties which resist, escape, or endure the disease.

Living with lily mosaic, G. L. SLATE and E. P. HALL (*Amer. Lily Yearbook*, 1940, pp. 27-32, fig. 1).—Following a brief discussion of control by detection and destruction of diseased lilies to prevent spread of the virus to healthy plants, and by planting bulbs of known freedom from infection and isolating them from diseased lilies, the author suggests growing only those varieties which for one reason or another are able more or less successfully to escape infection.

Toward this end, annotated lists are presented of lilies which nearly always escape mosaic infection, those which usually escape, those which remain moderately free, those which are tolerant, and those which are very susceptible.

Importance of *Verticillium* as a pathogen of ornamental plants. A. W. DIMOCK. (Cornell Univ.). (*Phytopathology*, 30 (1940), No. 12, pp. 1054, 1055).—Over a 2-yr. period the author isolated *Verticillium* strains from 17 species of ornamental plants (listed) showing symptoms of hadromycosis, including what were apparently first records for fall monkshood, bachelor's-button, larkspur, common foxglove, mignonette, salpiglossis, and African marigold, and the first report in North America for annual and perennial phlox and Oriental poppy. Inoculations on various hosts are noted, and additional susceptibles from Europe are listed. Limited cross-inoculations failed to indicate any host specialization in the strains used. Since the organism is present in most varietal plantings of florists' chrysanthemums, the desirability of sterilizing chrysanthemum soil before replanting with other ornamentals is emphasized.

Apparent recovery of American elms inoculated with *Ceratostomella ulmi*. S. J. SMUCKER. (U. S. D. A.). (*Phytopathology*, 30 (1940), No. 12, pp. 1052-1054).—The results of studies of 115 successfully inoculated trees indicated that the fungus had gradually died out in some of them. In such trees recovery had progressed from apparent to real. Subsequent inoculations of 10 each of the infected, recovered trees and of the noninfected controls indicated that failure of the infected trees to develop external symptoms during seasons following the original infection could not be attributed to any lack of pathogenicity of the fungus or to any immunity acquired by the trees.

Dutch elm disease and its control. D. S. WELCH and D. L. COLLINS (N. Y. State Col. Agr., Cornell Ext. Bul. 487 (1940), pp. 19, figs. 8).

Note on a heart rot of oak trees caused by *Polyporus frondosus* Fr. K. S. CARTWRIGHT (*Forestry*, 14 (1940), No. 1, pp. 38-41, pl. 1, figs. 3).

Mycelial extent beyond blister rust cankers on *Pinus monticola*. J. EHRLICH and R. S. OPIE. (Univ. Idaho.). (*Phytopathology*, 30 (1940), No. 7, pp. 611-620, fig. 1).—*Cronartium ribicola* mycelium in the distal ends of 116 cankers on green stems and branches and proximal ends of 146 cankers on green stems and green and flagged branches from three ecologically comparable areas in one northern Idaho locality was found to extend 0.5-3 (mean 1.66) cm. beyond the externally visible canker margins. No practical mean difference was found between distal and proximal measurements, or, for each type of canker, between measurements for the different areas. Mean extents were about 2.3 cm. for cankers on green stems, 1.5-1.6 cm. for cankers on green branches, and 1.2 cm. for cankers on flagged branches. Of 4 possibly related and readily determinable canker characters studied, diameter of cankered internode at the outer limits of surface discoloration was found to be most closely correlated with mycelial extent and to be most readily and accurately determinable in the field.

White pine blister rust control—Michigan.—Annual Reports, 1938, E. C. MANDENBERG; 1939, J. K. KROEBER ([Lansing]: Mich. Dept. Agr., 1938, pp. [4]+38, figs. 2; 1939, pp. [5]+53, figs. 3).

The presence of *Fusarium bulbigenum blasticola* in Argentina [trans. title], M. J. FREZZI (*Physis*, 15 (1939), No. 47, pp. 87-97, figs. 6).—This reports a study of the fungus and the damping-off of pine seedlings which it causes, and includes discussion of the symptoms, the fungus and its pathogenicity and cultural characters, and control of the disease by soil and seed disinfection.

The watermark disease of willows.—I, Host-parasite relationships, G. METCALFE (*New Phytol.*, 39 (1940), No. 3, pp. 322-332, pl. 1, figs. 2).—In addition

to *Bacterium salicis*, a white, a yellow, and a green-fluorescent bacterium were found constantly associated in watermarked willow wood. The bacterial population of diseased wood was found to change with time, *B. salicis* being inactivated after the first year, followed by a second invasion of the wood by the three associated bacteria and leading to the complete permeation of all the tissues. The distribution of the bacteria in the wood and the pathological effects are described. The infection of healthy wood and the spread of the bacteria in such wood are discussed in relation to the persistence of the disease in the tree from year to year.

Colorado rusts of woody plants, P. F. SHOPE (*Colo. Univ. Studies, Ser. D, Phys. and Biol. Sci.*, 1 (1940), No. 2, pp. 105-127).—An annotated list of 58 species, with key.

The effect of *Peniophora gigantea* and *Schizophyllum commune* on strength of southern yellow-pine sapwood, C. A. RICHARDS and M. S. CHIDESTER. (U. S. D. A.). (*Amer. Wood-Preservers' Assoc. Proc.*, 36 (1940), pp. 24-31, figs. 5).—The results of the tests reported are believed to indicate clearly that these two fungi, and particularly *P. gigantea*, should no longer be regarded as harmless. In large timbers in which they have not permeated the wood thoroughly the strength would be affected to a much less extent, but the tests have definitely shown that *P. gigantea* may reduce the strength of the wood considerably. The necessity for storage under as favorable seasoning conditions as possible and for limiting the length of the storage period is emphasized.

Proceedings of the Third National Plant Nematode Conference, edited by H. P. BARSS (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 1940, Sup. 124, pp. 135-150).—Abstracts of the following papers are presented: Inducing Uniform Soil Infestations of the Nematode *Heterodera marioni* as an Aid in Breeding for Resistance to Root Knot, by K. C. Barrons (Mich. State Col.); Remarks on Additions to a List of Hosts of the Root-Knot Nematode, by E. M. Buhrer; Resistance to Root Knot Nematode in *Nicotiana*, by E. E. Clayton; The Bulb Nematode (*Ditylenchus dipsaci*) in Narcissus Plantings in Western Oregon, by C. A. Cole; Some Observations on the Development of Root-Knot Nematode Diseases in Virginia, by S. [B.] Fenne; Some Suggestions for Quick Testing of Nematode Resistance in Plant Breeding Programs, by G. H. Godfrey (Tex. Expt. Sta.); Controlling Root-Knot Nematodes in Potatoes in the Klamath Basin by Means of Irrigation, by A. E. Gross (Oreg. Sta.); Control of Root Knot in Florida Cigar-Wrapper Tobacco Fields, by R. R. Kincaid (Fla. Sta.); Comparison of Crop Rotation and Fallowing as Methods of Control for Root Knot of Cotton Under Irrigation, by C. J. King; The Reniform Nematode [*Rotylenchulus reniformis*] as a Root Parasite, by M. B. Linford, J. M. Oliveira, and F. Yap (Univ. Hawaii); A Comparison of the Root-Knot Nematode and the Meadow Nematode, by C. W. McBeth; Recent Root Knot Damage in Potatoes, by J. T. Middleton (Calif. Citrus Sta.); The Effect of Crop Rotation on the Control of *Heterodera marioni* on Norfolk Sandy Loam Soil, by K. J. Shaw; Recent Field Observations on Tomato and Cotton Root-Knot Nematodes, by C. D. Sherbakoff (Tenn. Sta.); The Distribution and Relation of the Meadow Nematode, *Pratylenchus pratensis*, to Fusarium Wilt of Cotton in Georgia, by A. L. Smith; On the Occurrence of the Banana Nematode (*Pratylenchus musicola* [Cobb] Filipjev) in the United States, and The Root-Knot Nematode Attacking Stems and Leaves of Plants, both by G. Steiner; Some Further Observations on the Nematode Fusarium-Wilt Experiments at Lumberton, North Carolina, by A. L. Taylor, H. D. Barker, and P. H. Kime; Nematode Population and Species Determination Studies on Soils From the Regional Cotton Wilt Plots, by A. L. Taylor and A. L. Smith (coop. Ga. Sta.); Suggestions Arising From an Analysis of "Plants Reported Resistant or

Tolerant Toward Root-Knot-Nematode Infestation," by J. Tyler; Outline for Reports on Root-Knot Infestations With Particular Reference to the Resistance of Certain Plants; Nematode Studies at U. S. Regional Vegetable Breeding Laboratory [at Charleston, S. C.], by B. L. Wade; and Chemical Treatment of Soil to Control the Root Knot Nematode, by P. A. Young (Tex. Sta.).

Effect of blue stain on specific gravity and strength of southern pine, A. D. CHAPMAN and T. C. SCHEFFER. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 2, pp. 125-133).—The effect of blue stain on the specific gravity and strength of pine wood artificially inoculated with four fungus species (*Ceratostomella* spp. and *Graphium rigidum*) was essentially the same as reported for prior similarly controlled studies. Although all strength properties appeared to be lowered generally, only the effect on toughness was of general practical significance. The fungi did not affect the wood with equal severity, nor was their relative order of superiority in this respect entirely the same for all properties tested. There was some evidence of a broad relation between abundance of direct cell-wall penetration and reduction in toughness. The intensity of discoloration was not indicative of the severity of attack or of the comparative weakening. The frequency of association between a particular blue stain fungus and a certain kind of wood apparently does not necessarily indicate its inherent ability to attack the wood or to affect its strength.

Variation in *Helminthosporium sativum* induced by a toxic substance produced by *Bacillus mesentericus*, J. J. CHRISTENSEN and F. R. DAVIES. (Minn. Expt. Sta.). (*Phytopathology*, 30 (1940), No. 12, pp. 1017-1033, figs. 4).—*B. mesentericus* isolates grown on artificial media produced a substance suppressing growth, increasing conidial production, inhibiting or retarding germination, causing abnormal hyphal growth, and inducing mutation in certain races of *H. sativum*. This substance was thermostable, although prolonged heating tended to weaken its potency. It was diffusible, passed through a Berkefeld filter, was adsorbed on infusorial earth, withstood freezing and desiccation, tolerated acid, and was inactivated by alkali and by certain bacteria and fungi. Added to solid nutrient media, the sterilized bacterial cultures suppressed growth of many fungi but failed to increase the frequency of sectoring, except in *H. sativum* and possibly one species of *Penicillium*. Races of *H. sativum* responded quite differently to the toxic substance, and the frequency of sectoring was associated with its concentration, with certain types of medium, and with relatively high temperatures. *B. mesentericus* did not induce sectoring when grown in close association with *H. sativum*. A race of *H. sativum*, while growing on potato dextrose agar containing the toxic substance, gave rise to numerous variants differing in cultural characters, general physiology, pathogenicity, and to some extent in morphology. By means of mutation, *H. sativum* may adapt itself to a new environment, giving the appearance of increased tolerance to the toxic substance.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Blasting to improve wildlife environment in marshes, T. G. SCOTT and W. L. DEVER. (Iowa Expt. Sta. et al.). (*Jour. Wildlife Mgmt.*, 4 (1940), No. 4, pp. 373, 374, pls. 2).

Utilization of oaks by birds and mammals, W. R. VAN DERSAL. (U. S. D. A.). (*Jour. Wildlife Mgmt.*, 4 (1940), No. 4, pp. 404-423).—A review of the literature, a seven-page list of which is included, has shown 186 different kinds of birds and mammals to feed on oak products. Acorns have been recognized as preferred or staple foods of a great many of these animals, and oak browse is shown to be of outstanding importance to wild herbivores.

A study of deer populations by use of pellet-group counts, L. J. BENNETT, P. F. ENGLISH, and R. MCCAIN. (Pa. Expt. Sta. coop. U. S. D. A. et al.). (*Jour. Wildlife Mgmt.*, 4 (1940), No. 4, pp. 398-403).

A study of monthly variations in the nutritive value of several natural winter deer foods, H. HELLMERS. (Pa. Expt. Sta. et al.). (*Jour. Wildlife Mgmt.*, 4 (1940), No. 3, pp. 315-325, pl. 1, figs. 8).—In this study samples of eight species of woody plants browsed by deer were collected at monthly intervals and analyzed chemically to detect variations in their composition. Marked differences were found, especially in protein, nitrogen-free extract, and crude fiber, all of which exhibited trends indicating a reduction in nutritive value through the winter. The findings indicate that a representative index to the nutritive value of winter browse may be most easily and most satisfactorily obtained by collecting material monthly and analyzing composite samples made by mixing the original samples of each species in equal proportions. A few of the species analyzed compared very favorably in chemical composition with bluegrass and timothy. Most species, however, were considerably below these two grasses in nutritional qualities.

Territorial behavior and populations of some small mammals in southern Michigan, W. H. BURT (*Mich. Univ., Mus. Zool. Misc. Pub.* 45 (1940), pp. 58, pls. 2, figs. 10).—The study presented, commenced in the spring of 1935, was conducted in the attempt to secure information on the breeding seasons and populations of certain small mammals in southern Michigan. In concentrating on one species, the wood mouse (*Peromyscus leucopus noveboracensis*) was selected because of its common occurrence throughout wooded areas. Other forms observed were *Tamias striatus lysteri*, *Glaucomys volans volans*, *Blarina brevicauda talpoides*, *Pitymys pinetorum scalopsoides*, and *Synaptomys cooperi cooperi*. A list of 30 references to the literature cited is given.

Studies on a population cycle of snowshoe hares on the Lake Alexander area.—II, Mortality according to age groups and seasons. III, Effect of reproduction and mortality of young hares on the cycle, R. G. GREEN and C. A. EVANS. (Univ. Minn.). (*Jour. Wildlife Mgmt.*, 4 (1940), Nos. 3, pp. 267-278, figs. 2; 4, pp. 347-358, figs. 3).—Included are details concerning the mortality among snowshoe hares, with special reference to age groupings, additional to those previously noted (R. S. R., 83, p. 791). On this area in Minnesota, the proportion and the absolute number of yearling hares were markedly lowered during the years when the population was most drastically reduced, and rose sharply when the population began to increase. The mortality among adult hares was maintained at a relatively constant rate, irrespective of the cyclic changes in population measured by the annual census.

The changing mortality among immature hares during the first 9 mo. of life was found to be the principal factor in the fluctuation of the population of snowshoe hares on the Lake Alexander area during the recent cycle. A high mortality among the young hares caused the decline in population; a low mortality in young hares resulted in the increase in population before and after the period of decline. Neither the mortality among adult hares nor the rate of reproduction appear to have varied enough to be of major importance as a cause of the cycle. The role that shock disease plays as a cause of some of the phenomena described has been considered in an earlier contribution (R. S. R., 82, p. 825).

Notes on the food and parasites of the rabbits of a lowland area in Oklahoma, C. C. SMITH (*Jour. Wildlife Mgmt.*, 4 (1940), No. 4, pp. 429-431).

Food habits of the raccoon in eastern Iowa, L. W. GILES. (Iowa Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 4 (1940), No. 4, pp. 375-382).

The woodchuck as a soil expert, A. E. MOSS. (Univ. Conn.). (*Jour. Wildlife Mangt.*, 4 (1940), No. 4, pp. 441-443, fig. 1).

A systematic classification for the birds of the world, A. WETMORE (*Smithson. Misc. Collect.*, 99 (1940), No. 7, pp. [2]+11).

Autumn birds of an Eastern Bob-White Experimental Game Management Area in southern Iowa, E. SANDERS. (Iowa Expt. Sta. et al.). (*Iowa Bird Life*, 10 (1940), No. 3, pp. 39-42).

Birds of Oregon, I. N. GABRIELSON and S. G. JEWETT (*Corvallis: Oreg. State Col.*, [1940], pp. XXX+650, figs. [118], map. 1).—The introductory part of this work, based upon personal observations and the literature, includes a check list of the birds of Oregon, a general account of birds as a group, a discussion of the topography and life zones of the State, Federal bird refuges therein, a history of Oregon ornithology, and list of birds originally described from Oregon. The main part of the work, which consists of an annotated list of the birds of the State, includes a description of each form, its distribution, and notes on its occurrence and habits. A hypothetical list and a bibliography of 30 pages are included. A map of the life zones of the State, indicated in colors, by V. Bailey, is attached.

The phenology of some bob-white food and cover plants in Brazos County, Texas, T. P. CHENAULT. (Tex. A. and M. Col. et al.). (*Jour. Wildlife Mangt.*, 4 (1940), No. 4, pp. 359-368, fig. 1).

Food habits of the sharp-tailed grouse by analysis of droppings, G. SWANSON. (Minn. Expt. Sta.). (*Jour. Wildlife Mangt.*, 4 (1940), No. 4, pp. 432-436).—A contribution presented with a list of 22 references to the literature.

Seasonal food habits of the marsh hawk in Pennsylvania, P. E. RANDALL. (Pa. Expt. Sta. et al.). (*Wilson Bul.*, 52 (1940), No. 3, pp. 165-172).—Observations of the food habits of the marsh hawk during the course of a management study of the ring-necked pheasant in Pennsylvania are reported. Mice were the staple food during 10 mo. of the year, with juvenile birds the most important items of food during June and July. The effect of marsh hawks upon the pheasant population was negligible, and there was no reason to believe that the hawks were a limiting factor on other game species in the study area. It is concluded that the general food habits of the marsh hawk are beneficial to man, and that this hawk is a decided asset to an agricultural community.

Winter observations on pheasants in southeastern Minnesota, U. C. NELSON. (U. S. D. A.). (*Jour. Wildlife Mangt.*, 4 (1940), No. 4, pp. 369-372).—Deficiency in food and cover resulting in a high winter mortality is considered by the author to be the limiting factor in the management of ring-necked pheasants in southeastern Minnesota.

Turkey vultures in central Iowa, T. G. SCOTT and R. MOORMAN. (Iowa Expt. Sta.). (*Iowa Bird Life*, 10 (1940), No. 3, pp. 34-37, fig. 1).

Comparative psychology.—II, Plants and invertebrates, C. J. WARREN, T. N. JENKINS, and L. H. WARNER (*New York: Ronald Press Co.*, [1940], vol. 2, pp. XIII+1070, figs. 168).—Included in this work is a chapter on the Platyhelminthes, Nemathelminthes, Trochelminthes, and Annulata (pp. 440-540), also one on the Arthropoda (pp. 581-810). Examples cited represent, in the main, types that have been most widely used in behavior investigations. They are presented with bibliographies (pp. 898-915, 928-1021).

The feeding habits of larval newts with reference to availability and predilection of food items, W. J. HAMILTON, JR. (Cornell Univ.). (*Ecology*, 21 (1940), No. 3, pp. 351-356, figs. 2).

Brown snail infestations, A. J. BASINGER. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 25 (1940), No. 7, p. 226).—Reference is made to control measures for the European brown snail, of which there was an enormous increase in numbers in 1939.

Common names of economic insects in different countries, VI, VII [trans. title], G. SCHMIDT (*Ent. Beihefte Berlin-Dahlem*, 6 (1939), pp. [1]+160; 7 (1940), pp. [1]+161-364).—The first part of this compilation (pp. 1-119) lists the common German names of insects and includes alphabetical indexes of the species and genera and a four-page list of references to the literature. Part 2 (pp. 120-354) lists the common English, French, Italian, Spanish, and Dutch names of insects, followed by alphabetical indexes of the species and genera and a four-page list of references to the literature. A supplement to part 1 is appended.

The value of a State collection of insects, H. S. TELFORD (*North Dakota Sta. Bimo. Bul.*, 3 (1940), No. 2, p. 19).—Attention is drawn to the value of a State insect collection in the ready identification of injurious and beneficial forms.

Insect life without vitamin A, R. E. BOWERS and C. M. MCCAY. (Cornell Univ. et al.). (*Science*, 92 (1940), No. 2387, p. 291).—It is considered evident from experiments conducted that the German cockroach needs no vitamin A in its diet, since its body can function normally throughout its life cycle without this vitamin.

[Contributions on economic insects, insecticides, and insect control] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar.*, 1940, E-496, pp. 5; E-497, pp. 9, pls. 4; E-498, pp. 6, pls. 3; E-499, pp. 8, pl. 1; E-500, pp. 5; E-501, pp. 3; E-502, pp. 13, pls. 2; E-503, pp. 2; E-504, pp. 56; E-505, pp. 7, pls. 6, fig. 1; E-506, pp. 19, pl. 1; E-507, pp. 5; E-508, pp. 21, pls. 5; E-509, pp. 33; E-510, pp. 5; E-511, pp. 4, pl. 1; E-512, pp. 4; E-513, pp. 4; E-514, pp. 43).—The following contributions are in continuation of this series (*El. S. R.*, 83, p. 216); The Use of Derris and Cube Washes in the Control of Cattle Grubs, by R. W. Wells (E-496); The Use of Oil or Oil Containing Pyrethrins for Earworm Control in Sweet Corn, by G. W. Barber (E-497), which supersedes E-476 (*El. S. R.*, 81, p. 806); A Cattle Fly Trap for the Control of Horn Flies, by W. G. Bruce (E-498); Control of Insects on Growing Tobacco Plants of the Flue-Cured Type, by W. A. Shands, N. Allen, and J. U. Gilmore (E-499); Weevils Which May Attack the Bases and Roots of Conifers in the Lake States and Methods of Preventing Injury, by H. J. MacAloney (E-500); Suggested Control Recommendations for Tobacco Insects on Sun-Grown Cigar-Type Tobacco in the Georgia and Florida Producing Region, by F. S. Chamberlin (E-501); The Periodical Cicada, Brood XIV, by J. A. Hyslop (E-502); Methods Used to Combat the White-Fringed Beetles (E-503); A List of Commercially Available Detergents, Wetting, Dispersing, and Emulsifying Agents, by H. L. Cupples (E-504); The White-Fringed Beetle, by L. J. Padget and K. S. Littig (E-505); Investigations in Control of Hemipterous Cotton Insects in Arizona by the Use of Insecticides, by T. P. Cassidy and T. C. Barber (E-506); The Bulb Scale Mite, by C. F. Doucette (E-507); Concentrated Spray Mixtures and Their Application by Ground and Aerial Equipment as Compared With Standard Spraying and Dusting Methods, by S. F. Potts (E-508); Bibliography of the Codling Moth, 1935, by F. M. Wadley (E-509); Some Deterrents as a Control for the Melonfly, by R. H. Marlowe (E-510); Standard Method for the Distillation of Geraniol, by L. Koblitzky and R. D. Chisholm (E-511); Fumigation of Bulk Soil With Methyl Bromide for the White-Fringed Beetle in New Orleans (E-512) and Methyl Bromide Fumigation of the White-Fringed

Beetle Larva in Small Flowerpots in New Orleans (E-513), both by E. M. Livingstone; and Abstracts of Recent Foreign and Domestic Patents Relating to Derris, Lonchocarpus, Tephrosia, and Rotenone (First supplement to E-446), by R. C. Roark (E-514) (E. S. R., 80, p. 365).

[Contributions on economic entomology] (*Assoc. South. Agr. Workers Proc.*, 41 (1940), pp. 110-119).—Contributions presented at the annual meeting of the Cotton States Branch of the American Association of Economic Entomologists held in February 1940 include the following: History of the Cotton States Branch of the American Association of Economic Entomologists, by O. I. Snapp (pp. 110-112), Calcium Arsenate Dusting of Cotton and Its Influence on pH of Cell Sap and Aphid Populations, by E. W. Dunnam, and J. C. Clark (pp. 112, 113), A Field Test of Timed Poisoning Schedules for the Protection of Sea Island Cotton From the Cotton Boll Weevil (p. 113) and A Possible Alternative Method of Measuring Boll Weevil Injury to Cotton (p. 114), both by P. M. Gilmer, Combination of Insecticides for Boll Weevil and Cotton Leaf Aphid Control, by C. F. Rainwater and F. F. Bondy (p. 114), Progress Report (1939) on Mixtures of Calcium Arsenate and Sulfur for Control of the Boll Weevil at State College, Mississippi, by R. L. McGarr (p. 114), The Effect of Several Insecticides Used in Boll Weevil Control Tests Upon Aphid and Mirid Infestations, by R. C. Gaines, M. T. Young, and G. L. Smith (p. 115), The Amazon Fly *Metagonistylum minense* Towns., a Promising Parasite of the Sugarcane Borer, by T. E. Holloway and R. Mathes (p. 116), Lateral Migration and Depth of Pupation of the Larvae of the Primary Screwworm (*Cochliomyia americana* C. & P.), by B. V. Travis, E. F. Knipping, and A. L. Brody (p. 116), Biology of *Pantomorus peregrinus* Buch., by J. B. Gill and H. C. Young (p. 117), Biology and Habits of *Pantomorus taeniatulus* Berg., by H. C. Young and H. S. Hollingsworth (p. 118), Recent Notes on the Biology of the White-Fringed Beetle, by H. S. Hollingsworth, B. A. App, and H. C. Young (p. 118), A System of Classifying Cabbage According to Extent of Caterpillar Injury and The Occurrence and Relative Abundance of the Various Species of Cabbage Caterpillars on Cabbage in the Charleston, S. C., Area, both by W. J. Reid, Jr., and C. O. Bare (p. 118), and Results of Tests With Benzene, Paradichlorobenzene, and Other Insecticides Against the Tobacco Flea Beetle (*Epitrix parvula* (F.)) in Plant-Beds, by N. Allen and W. A. Shands (p. 119) (all U. S. D. A.); Boll Weevil Control Tests With Calcium Arsenates Containing Different Percentages of Water-Soluble Arsenic Pentoxide, by R. C. Gaines (p. 113); Boll Weevil Control Tests With Several Insecticides, by M. T. Young, G. L. Garrison, and R. C. Gaines (p. 113); A New Method of Mounting Insects for Student Collections, by F. E. Guyton (p. 115); The Pest Control Division, the University of Florida, Gainesville, by J. T. Creighton (p. 115); Some Extension Experiences With the New Type of Ant-Bait Containers, by W. C. Nettles (p. 116); Insecticides for Greenhouse Pests, by S. H. Coleman and C. Lyle (pp. 116, 117); Insecticide Tests Against the Striped Cucumber Beetle (*Diabrotica vittata*), by C. Lyle (p. 117) (Miss. Expt. Sta.); Second Report on the Host Plants and Parasites of the Cowpea Curculio and Other Legume Infesting Weevils, by T. L. Bissell (p. 117) (Ga. Sta.); and A Progress Report on the Use of Rotenone Dusts for the Control of the Pickleworm and Melonworm in Alabama, by F. S. Arant (p. 119) (Ala. Sta.).

[Report of work in entomology by the New Haven Station.] (Partly Coop. U. S. D. A.). (*Connecticut [New Haven] Sta. Bul.* 438 (1940), pp. 500-508).—The work of the year reported upon (E. S. R., 81, p. 540) relates to the Japanese beetle, biology and control of termites, European corn borer, wireworms, squash bug and squash vine borer, smaller European elm bark beetle,

oriental fruit moth, European red mite, substitutes for lead arsenate for the control of the apple maggot, a comparison of adhesives for the special curculio spray, and an investigation of oil sprays.

The ninth annual insect population summary of Kansas, 1939, R. C. SMITH and E. G. KELLY. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 13 (1940), No. 3, pp. 65-85).—This annual report (E. S. R., 88, p. 217) gives a summary of weather conditions in Kansas during 1939, followed by a descriptive account of the more striking insect activities and climatic relationships for the year.

[Work in economic zoology and entomology by the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 399 (1940), pp. 25, 29-34, 44-47, 51, 52, 66, 67, figs. 2).—The work of the year reported upon (E. S. R., 82, p. 353) includes notes on the worst enemies of cottontails, by J. D. Buehle; mortality of ring-necked pheasants, crippled pheasant losses, food of marsh hawks, and nesting habits of pheasants, all by P. E. Randall; fall foods of ruffed grouse, by T. M. Kuhn; pellet group counts for determination of deer population, by L. J. Bennett, P. F. English, and R. McCain (coop. U. S. D. A.); banding of American woodcocks, by A. T. Studholme, Buehle, and R. T. Norris; winter browse poor deer food, by E. B. Forbes; tagged trout taken by anglers, by G. L. Trembley; migration of trout, by R. L. Watts; flea beetles on tobacco, sod webworms, and hairy chinch bugs, all by H. N. Worthley; codling moth control, by Worthley and D. E. H. Frear; pistol casebearer control, by H. M. Steiner; dormant spray for scale and mites, by Worthley and Steiner; new and safer spray materials, by H. W. Thurston, Jr., and H. Miller; spray schedule for the grape berry moth, by Worthley and B. D. Gleissner; and control of cecidomyiid larvae in mushroom houses, garden centipedes, and red spiders, all by C. A. Thomas.

A summary of the sugarcane insect investigations conducted at the Houma Laboratory of the Federal Bureau of Entomology and Plant Quarantine during 1939, J. W. INGRAM. (U. S. D. A.). (*Sugar Bul.*, 19 (1940), No. 4, pp. 4-6).—The results of work in Louisiana during 1939 with the sugarcane borer, insect transmission of mosaic, and the sugarcane beetle are reported.

[Notes on work with cranberry insects in 1940], C. S. BECKWITH. (N. J. Expt. Stas.). (*Amer. Cranberry Growers' Assoc. Proc. Ann. Conv.*, 71 (1940), pp. 12, 13, 16, 17).—A brief reference is made to the application of pyrethrum by ground dusters and of oil from airplanes for the control of the leafhopper causing false blossom.

Studies of the tip worm have shown the occurrence of two generations a year, one working in early June and the other in early July, and that it overwinters in a cocoon attached to a fallen leaf or stem and is not affected by the winter flood. Fifty-five first-generation flies emerged between May 23 and June 4 and were captured in a cage which covered 16 sq. ft. of surface on an infested bog. A small second generation appeared starting on June 13 and continued to emerge over a period of 20 days. Oviposition apparently commenced when the flies were less than 3 days old. A definite advance was made during the year in the determination of the 2-day (24 to 48 hr.) incubation period, the feeding of the insect on one leaf before moving to one of the new tips, and the probability of at least 2 days open feeding on the tip leaves.

Relation of cover crops to citrus insects, J. R. WATSON. (Fla. Expt. Sta.). (*Citrus Indus.*, 21 (1940), No. 7, pp. 11, 18).

Annual report of the forest insect survey, 1939, A. W. A. BROWN (*Canada Dept. Agr., Forest Insect. Survey Ann. Rpt.*, 1939, pp. 37, figs. 14).

Insect pollinators of toria (*Brassica napus* Linn., var. *dichotoma* Prain), and sarson (*B. campestris* Linn., var. *sarson* Prain) at Lyallpur, K. A.

RAHMAN (*Indian Jour. Agr. Sci.*, 10 (1940), No. 3, pp. 422-447).—A study was made of the habits and usefulness of insect visitors to toria and sarson flowers. Of the more than 100 different insect species collected, representing 55 families of 9 orders, *Apis florea*, *Andrena ilerda*, *Halictus* sp., and *Eristalis tenax* were found to be the most important pollinators. A study of the hourly frequency of the insect visitors confirmed this conclusion.

Insect transmission of plant diseases, J. G. LEACH (*New York and London: McGraw-Hill Book Co.*, 1940, pp. XVIII+615, [pl. 1], figs. 238).—This work brings together the present status of knowledge of insects as relates to their transmission of plant diseases. Each of the 17 chapters includes a quite complete list of references to the literature consulted.

Entomophagous insects, C. P. CLAUSEN (*New York and London: McGraw-Hill Book Co.*, 1940, pp. X+688, figs. 257).—The present knowledge of insects as parasites or predators of other insects is brought together, arranged by orders and families. Entomophagous forms of the orders Hymenoptera (pp. 3-342), Diptera (pp. 343-484), Lepidoptera (pp. 485-498), Strepsiptera (pp. 499-524), and Coleoptera (pp. 525-584) are of particular importance. Such forms of 11 additional orders also considered include Hemiptera (pp. 585-590), Thysanoptera (p. 591), Trichoptera (p. 591), Mecoptera (p. 592), Plecoptera (p. 592), Neuroptera (pp. 593-607), Odonata (p. 608), Corrodentia (p. 609), Orthoptera (pp. 610, 611), Dermaptera (p. 612), and Thysanura (p. 612). A 47-page list of references to the literature cited is included.

Recent records of the introduction of beneficial insects into the Hawaiian Islands (*Hawaii. Ent. Soc. Proc.*, 10 (1938), No. 2, pp. 349-352).

Recent contributions of insect physiology to insect toxicology and control, W. M. HOSKINS (*Hilgardia [California Sta.]*, 13 (1940), No. 6, pp. 307-386).—This discussion of the subject is accompanied by a 15-page list of references to the literature cited.

A simple apparatus for the determination of thermal death points, E. T. ROUSE and R. O. CHRISTENSON. (*Ala. Expt. Sta.*). (*Amer. Micros. Soc. Trans.*, 59 (1940), No. 3, pp. 275-278, figs. 2).—The apparatus here described for determining the point of irreversible coagulation of the protoplasm of animal parasites records the temperature of the culture itself. The apparatus which supplies the heat consists of a steam aspirator which forces the steam into a water bath containing the culture vial with its inserted thermometer.

The scientific principles of plant protection, with special reference to chemical control, H. MARTIN (*London: Edward Arnold & Co.*, [1940, 3. ed.], pp. X+385).—Among the 16 chapters of this work, those which relate particularly to entomology are: Plant resistance (pp. 9-33), the influence of external factors on the susceptibility and liability of the plant to attack (pp. 34-52), biological control (pp. 53-69), fungicides and insecticides (pp. 70-108), insecticides (pp. 156-238), fumigants (pp. 245-257), soil treatment (pp. 276-294), toxic action and chemical constitution (pp. 295-310), traps (pp. 311-326), and the treatment of the centers and vectors of infection (pp. 327-343).

Prolonging toxicity of pyrethrum insect sprays, R. B. TRUSLER (*Soap and Sanit. Chem.*, 16 (1940), No. 1, pp. 115, 117, 119).

Pyrethrum deterioration, A. WEED (*Pests*, 8 (1940), No. 9, pp. 11, 12).

Deposition and retention of sprays on apples, II, D. E. H. FREAR and H. N. WORTHLEY (*Pennsylvania Sta. Bul.* 400 (1940), pp. [2]+22, figs. 5).—The results of a further investigation (*E. S. R.*, 78, p. 365) of the amounts of lead and arsenic retained upon the fruits and foliage of apples sprayed in 1937 and 1938 with acid lead arsenate in various schedules and mixtures are reported. It was found that the lead and arsenic deposits were greater on fruits from the

bottoms of the trees than on those from the tops. "Calculations of the Pb : As₂O₃ ratio in the data collected gave no consistent figure for either fresh or weathered deposits nor consistent differences in the ratios exhibited in different spray mixtures. The ratio in treatments to the Jonathan variety was greater in 1937 than in 1938 (3.52 and 2.15). In treatments applied to Stayman Winesaps and to Jonathans from the same tanks of spray mixture in 1938 the ratio was nearly twice as great in the former variety (4.16 and 2.15). In 1937 the spacing of spray applications at progressively longer intervals to compensate for the diminishing growth rate of the fruits, 'growth schedule' applications, did not maintain a consistently higher level of spray deposits than the spacing of applications at uniform intervals, when both schedules consisted of five cover sprays ending on the same date. In 1938 the deposits produced by a growth schedule of three cover spray applications ending on June 9 were much reduced by subsequent growth of the fruit before the cessation of codling moth attack, as compared with a schedule of four uniformly spaced applications ending on June 30. In 1937 it appeared that the addition of 1 pt. of fish oil per 100 gal. of spray mixture resulted in greater deposits of lead and arsenic than the addition of 1 lb. of soybean flour. Retention of lead but not of arsenic was greater with soybean flour.

"As compared in four-cover spray schedules in 1938, soybean flour at 1 lb. and skim milk powder at 0.5 lb. per 100 gal. of spray mixture showed little difference in their effect on the deposit and retention of lead and arsenic. In 1937 a schedule of three cover sprays ending on June 26, the last two of which were inverted or 'Washington State College dynamite' spray mixture, built up considerably higher deposits of lead and arsenic than any noninverted spray mixture. On July 23, however, after 32 days of exposure, the deposits were lower than in treatments receiving two additional noninverted spray applications ending on July 17, and thus analyzed after 11 days of exposure. In 1938 a treatment involving two cover sprays, the second of which was applied on June 6 and comprised a double concentration of lead arsenate in a 'modified Washington State College dynamite' spray mixture, applied at a double dosage per tree, showed deposits of lead and arsenic nearly as great as those in treatments receiving the last of four lead arsenate sprays in noninverted mixtures on June 30, when fruit samples were analyzed on July 1. The 'dynamite' treatment . . . afforded as good codling moth control as more extended spraying schedules."

Plant galls and gall makers, E. P. FELT (*Ithaca, N. Y.: Comstock Pub. Co., 1940, pp. VIII+364, pls. 41, figs. 344*).—This book is planned to give a general idea of insect galls and their producers and to facilitate identification of the nearly 2,000 plant deformities listed in North America. Part 1 (pp. 3-35), which is introductory, discusses gall types, the principal gall producers, the various ways in which galls are developed, the biology and the economic importance of galls, and their alternation of generations. Included is a list of the known agamic and bisexual forms of American gall wasps. Part 2 (pp. 39-338) lists and classifies the galls according to their plant hosts and describes them concisely. There is a general account of the gall makers and of their preferences under each of the plant families especially favored by gall insects. The book is a greatly extended and more comprehensive account of the author's key to American insect galls previously noted (*E. S. R.*, 40, p. 554). A selected bibliography of recent publications is included.

Grasshopper injury among wheat varieties, R. W. SMITH. (U. S. D. A.). (*6. Hard Spring Wheat Conf., Minneapolis, 1939, Rpt., pp. 53, 54*).—Tables are given of the results of observations of grasshopper injury and stem rust made

in the spring wheat nursery in the Dickinson region of North Dakota in 1938. Reference is made to several theories that have been advanced as to why badly rusted varieties should be injured more by grasshoppers than those having but little rust.

Grasshopper populations (Orthoptera: Acrididae) of typical pastures in the Bluestem region of Kansas, D. A. WILBUR and R. F. FRITZ. (Kans. Expt. Sta.). (*Jour. Kans. Ent. Soc.*, 13 (1940), No. 3, pp. 86-100, fig. 1).

The toxicity of yellow phosphorus to cockroaches, T. H. CHENG (*Ohio State Univ., Abs. Doctoral Diss.*, No. 31 (1940), pp. 39-48, figs. 2).—Through quantitative feeding of phosphorus paste diluted with sirup, the medium lethal dose of phosphorus for the American cockroach was determined to be 0.02 mg. per gram, showing that it is a highly toxic stomach poison for this species. For this cockroach it was much more toxic than was sodium arsenite or sodium fluoride when the latter were fed in the same viscous medium, and the phosphorus was imbibed more rapidly and with less regurgitation than were the other two poisons. Sodium arsenite was more toxic in water than in sirup, but even in water it was less toxic than phosphorus. The German cockroach was less susceptible to phosphorus in paste diluted with sirup than was the American cockroach, the medium lethal dose for the former being 0.13 mg. per gram as compared with the 0.02 mg. per gram for the latter, but it is pointed out that the larger medium lethal dose for the German cockroach cannot alone account for the failure of phosphorus paste to control this species in practice. It is likely that the German cockroach does not imbibe diluted paste as freely as does the American cockroach. The practical control of cockroaches with phosphorus paste may be attributed not only to its action as a stomach poison but possibly to its effect as a contact poison and fumigant.

Effect of pH on the toxicity of nicotine injected into the cockroach *Periplaneta americana* (L.), C. H. RICHARDSON and L. O. ELLISON. (*Iowa Expt. Sta.*). (*Iowa State Col. Jour. Sci.*, 14 (1940), No. 3, pp. 305-316, figs. 4).—In order to determine whether molecular nicotine is more effective than ionic nicotine when injected into the American cockroach, relatively large doses and sublethal, paralytic doses of the alkaloid at several H-ion concentrations were administered to adult insects. Injection was made into the body cavity by puncture at the base of a posterior leg, the method resembling intraperitoneal injection of vertebrate animals. No significant difference was observed in the mortality from relatively large doses of injected nicotine that could be related to the pH of the solutions; nor did the paralytic and recovery times after injection of sublethal doses vary consistently, throughout the experiments, with the H-ion concentration. Such differences as did occur did not support the hypothesis that injected nicotine molecules are more active than injected ions. Male cockroaches are more susceptible than the females to large doses of injected nicotine, but no sex difference was observed in the reaction times or recovery times of insects injected with sublethal, paralytic doses. Twenty-four references are given to the literature cited.

Effects of liquid household insecticides on the oothecae of the German cockroach, B. M. PARKER (*Ohio State Univ., Abs. Doctoral Diss.*, No. 31 (1940), pp. 257-264).—It was found in tests conducted that pyrethrum and thiocyanate were highly toxic to the females of the German cockroach. Pyrethrum caused a majority of the females to drop their oothecae and apparently had some toxic effect on the oothecae. Of roaches sprayed with thiocyanate (Lethane 384) the majority of females retained their oothecae after death, and this insecticide appeared to be less toxic to the oothecae than pyrethrum although it exercised some control over hatching. Rotenone and cresylic acid, at the concentrations

used, had no marked effect on either the adult females or the oothecae. When the total percentage of oothecae failing to hatch was calculated for each spray at each dosage and compared with the total percentage of adult females killed, it was apparent that, in general, the oothecae were decidedly more resistant to the pyrethrum and thiocyanate sprays than were the adult females.

The selenium content of grasshoppers found feeding on seleniferous vegetation, A. L. MOXON. (S. Dak. State Col.). (*S. Dak. Acad. Sci. Proc.*, 19 (1939), pp. 69, 70).—A report is made of the selenium content of grasshoppers, infestations by which have been severe in the seleniferous as well as in non-seleniferous areas of South Dakota during the past few years. The selenium content of grasshoppers and of the vegetation upon which they were feeding indicates a direct correlation between the selenium content of the insects and that of the vegetation upon which they fed. Since selenium toxicity is prevented by arsenic and arsenic toxicity is more or less prevented by selenium, the effectiveness of arsenic as a poison for grasshoppers in seleniferous areas is questionable.

Controlling rose thrips, A. C. DAVIS. (U. S. D. A.). (*Amer. Rose Ann.*, 1940, pp. 106, 107).—Experimental control work with the flower thrips on roses during two seasons led to the conclusion that in gardens where roses are grown for cut flowers tartar emetic-brown sugar sprays, consisting of tartar emetic 1, 1½, and 2 oz., brown sugar 7½ oz., and water 3 gal., may be used to advantage in reducing the number of thrips per rosebud. Application of the spray every 2 or 3 days is necessary to protect the opening buds adequately. It was found that picking all open flowers apparently does not give any great degree of protection to the buds.

Cocoon-spinning Thysanoptera, S. F. BAILEY. (Univ. Calif.). (*Pan-Pacific Ent.*, 16 (1940), No. 2, pp. 77-79).

Some unexpected species of Arthropoda found in South Dakota, H. C. SEVERIN. (S. Dak. State Col.). (*S. Dak. Acad. Sci. Proc.*, 19 (1939), pp. 86-88).

Say's stink bug, J. A. MCNEO and F. G. BUTCHER (*North Dakota Sta. Bimo. Bul.*, 3 (1940), No. 2, pp. 11-13, fig. 1).—A brief account is given of Say's stinkbug, which has been increased in abundance in North Dakota during the past few years. An outbreak in 1940 resulted in severe injury to more than 10,000 acres of wheat in one southwestern county, with damage in many fields being so high that the grain was not worth harvesting. Its injury to flax was also extensive in that area. As yet no practical method has been developed for its complete control. Mention is made of several practices of value, including the burning of weeds and trash in which the bugs hibernate, plowing of infested stubble fields during the usual course of summer-fallowing, early spring burning of trash cover in narrow strips, especially along margins adjoining cultivated cropland, and working the stubble fields shortly after harvest with various types of subsurface tillage implements to inhibit heavy weed growth late in the season.

Some Tingitidae (Hemiptera) from the Eastern Hemisphere, C. J. DRAKE and M. E. POOR (*Hawaii. Ent. Soc. Proc.*, 10 (1938), No. 2, pp. 203-207, fig. 1).—The genera *Cetiocysta* and *Corythauma* are erected and seven species described as new. Notes and revisions on several species from India, Australia, and Africa are included.

Synonymy and distribution of the Lantana lace bug [*Teleonemia scrupulosa*] (Hemiptera Tingitidae), C. J. DRAKE and D. M. FRICK (*Hawaii. Ent. Soc. Proc.*, 10 (1938), No. 2, pp. 199-202, fig. 1).

Influence of planting date on potato leafhopper population and hopperburn development, T. C. ALLEN, G. H. RIEMAN, and J. S. McFARLANE. (Wis. Expt. Sta.). (*Amer. Potato Jour.*, 17 (1940), No. 11, pp. 283-286, figs. 2).—It was found in work in Wisconsin that the percentage of hopperburn development was greater in early maturing potato varieties than in late maturing varieties, regardless of the planting date. Percentage hopperburn development was reduced by deferring the planting date with both early and late varieties of potatoes. Nymphal leafhopper population is closely correlated with percentage hopperburn development in respect to time of planting. The results indicate that the relative earliness or lateness of a variety is not the prime factor in determining its resistance or susceptibility to hopperburn.

Studies of methods and materials for the control of the leafhopper *Empoasca fabae* as a bean pest, D. M. DeLONG (*U. S. Dept. Agr., Tech. Bul.* 740 (1940), pp. 61, figs. 25).—Laboratory and field tests for the control of the potato leafhopper under way at Columbus, Ohio, in 1926, 1927, and 1928, with additional studies in Florida and Ohio in 1932 and 1933, are reported upon.

Pyrethrum sprays were found to be immediately effective but lacked residual effect. Bordeaux mixture, both in laboratory and field plot tests, was not immediately effective but gave a high percentage of control in 4 or 5 days after application and a residual effect against hatching leafhoppers for 10 days or more following application. It is concluded that the plant physiology is changed by bordeaux residue in such a way that a temporary resistance is brought about in the plant. Several forms of sulfur were used on plants as sprays and dusts. All these showed some residual toxicity to leafhoppers, but some types were much more effective in this way than others. Flotation sulfur, wettable dry sulfur, and dry-mix sulfur used as sprays and dusting sulfur gave the best results. Dusting sulfur was also used with pyrethrum dusts which contained different amounts of pyrethrins (1, 0.5, and 0.05 percent). Combinations of sulfur and pyrethrum (0.5 percent) 90-10, sulfur and pyrethrum (1 percent) 95-5, and sulfur and pyrethrum (0.05 percent) 75-25 gave good toxicity and good residual value. Fifty-four references cited are listed.

Derris infusion as a poultry dip for louse eradication, R. B. GAPUZ (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 2, pp. 153-161, pls. 2).—Infusions in water of crushed fresh roots of *Derris philippinensis* in the proportion of 1:100 and over were found effective against all kinds of chicken lice. In view of the variation in the toxic constituents of derris roots, it is recommended that the strength of the infusion to be used in the eradication of lice be 2 percent or more. Concentration as high as 5 percent was used safely in this study.

A list of the genera and subgenera of the Aleyrodidae, E. A. DREWS and W. W. SAMPSON. (Univ. Calif.). (*Bul. Brooklyn Ent. Soc.*, 35 (1940), No. 3, pp. 90-99).—Sixty-nine genera and subgenera of Aleyrodidae are listed, with the authority, genotype, date, and place of description of each.

Biological control of mealybugs in greenhouses, W. D. WHITCOMB (*Massachusetts Sta. Bul.* 375 (1940), pp. 22, figs. 2).—Report is made of studies of *Cryptolaemus montrouzieri* Mulsant, a ladybeetle first introduced from Australia into California in 1892, where it has become one of the important natural enemies of mealybugs infesting citrus trees. This coccinellid has been reared on the citrus mealybug and the long-tailed mealybug on gardenias and on the Mexican mealybug infesting chrysanthemums under normal conditions in Massachusetts greenhouses. Its larvae were shown to eat about 1,325 mealybug eggs, the equivalent of 3 or 4 mealybug egg masses, during their life and to eradicate completely an average mealybug egg mass in 9 or 10 days. "A constant temperature of 60° F. definitely retarded the development and activity

of the beetle so that it did not hold the mealybug in check, but satisfactory results were obtained at 70° and 80°. Practical control of mealybugs by this predatory beetle was secured (1) from April 1 to September 1, when a temperature above 70°, which would stimulate the development and activity of the beetle, could be maintained; (2) when the infestation of mealybugs was great enough to provide adequate food without causing unprofitable injury to the plants; (3) on plants which will tolerate warm growing conditions favorable to the activity of the beetle; (4) when the beetles were liberated at the rate of one for each gardenia plant or one for each two chrysanthemum plants; [and] (5) when the use of insecticides necessary to control other pests did not kill the majority of the beneficial predators. When these conditions were provided, as described in detail, *C. montrouzieri* controlled or eradicated a heavy infestation of mealybugs within 9 or 10 weeks after they had been successfully liberated and a normal number of second-generation larvae had developed."

A new Pergandeida from the Colorado desert (Homoptera: Aphididae), R. C. DICKSON. (Calif. Citrus Expt. Sta.). (*Pan-Pacific Ent.*, 16 (1940), No. 2, pp. 57, 58, fig. 1).—*P. calvillae*, an aphid collected on *Suaeda suffretescens* near Indio, Calif., is described as new.

Three aphids of the genus *Brevicoryne* Van der Goot, C. F. SMITH and G. F. KNOWLTON. (N. C. Expt. Sta. coop. Utah State Agr. Col.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 2, pp. 404, 405, fig. 1).—The cabbage aphid, *B. salicinis* n. sp., and *B. symphoricarpi* (Thos.), are noted, with a table for their separation.

The emergence of a neotropical mantispid [*Mantispa interrupta* Say] from a spider egg sac, H. E. MILLER. (Minn. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 2, pp. 357-360).

Control of pineapple caterpillar, C. A. THEOBOLD and A. PICKLES (*Trop. Agr. [Trinidad]*, 17 (1940), No. 11, pp. 215, 216).—Report is made of an experiment with derris preparations in an attempt to control the injury to pineapple fruits by the larva of the lycaenid butterfly *Imolus echion* L. The results suggest that some control of its attack is achieved through the use of Derrimac dust applied to the fruits at intervals of 2 weeks.

Biology and control of strawberry leafroller *Ancylis fragariae* Walsh & Riley, R. L. PARKER and P. G. LAMERSON (*North Cent. States Ent. Proc.*, 18 (1939), pp. 97, 98).

Differential injury within varieties, inbred lines, and hybrids of field corn caused by the corn earworm (*Heliothis armigera* (Hbn.)), R. H. PAINTER and A. M. BRUNSON. (Kans. Expt. Sta. and U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 2, pp. 81-100, figs. 3).—The results of an investigation conducted at Manhattan, Kans., to determine the range of injury caused by the corn earworm to various strains and varieties of corn and to classify the varieties, hybrids, and inbreds on the basis of the amount of injury sustained, are reported, the details being given in six tables. A consistent tendency toward resistance or susceptibility to earworm damage to ears was shown to be transmitted by certain inbred lines of corn. "Length of husk extension and date of flowering have some influence on the amount of damage to ears, particularly in heterogeneous material, but many marked breaks in the correlations occur, suggesting other and more subtle causes of differences in severity of injury. Under conditions at Manhattan the relatively susceptible strains appear more sensitive to the influence of date of flowering and length of husk extension than do the relatively resistant strains. The greater influence of these factors in open-pollinated varieties may be due to the high proportion

of susceptible individuals present in the material studied. Differences in resistance and susceptibility to injury to the developing curl or bud of young corn plants are also inherited. Such differences appear to be independent of the differences in resistance to damage to ears caused by the same insect. There are indications that resistance to earworm injury may be increased by mass selection within an open-pollinated variety." Twenty references to the literature cited are included.

Parasites of the oriental fruit moth in Japan and Chosen and their introduction into the United States, G. J. HAEUSSLER (U. S. Dept. Agr., Tech. Bul. 728 (1940), pp. 62, figs. 3).—The present contribution reports upon the results of the first 2 yr. (1932–33) of the search for parasites of the oriental fruit moth that has been in progress continuously in Japan and Chosen (Korea) since it was inaugurated in January 1932. Following a brief introduction and description of field investigations and scope of work, the methods used in conducting parasite surveys, species of parasites reared from the oriental fruit moth in Japan and Chosen, parasitization of the various stages of the fruit moth in these two areas, and collection, rearing, and shipment of the oriental fruit moth parasites are dealt with. Sixty-one species of parasites were reared from this pest in many of the important peach-, pear-, and quince-producing regions of Japan and Chosen. *Trichogramma minutum* was the only true egg parasite reared, although the braconid *Phanerotoma grapholithae* also oviposits in that stage of the host. Twenty-two species, including *P. grapholithae*, were reared as primary parasites of twig-infesting larvae. Thirty-eight species were reared as parasites of oriental fruit moth stages within the cocoon.

Studies on the life history of the codling moth in southwestern Quebec, A. A. BEAULIEU (Sci. Agr., 20 (1940), No. 11, pp. 624–631, figs. 2).—Life history studies of the codling moth, details of which are given in the tables and charts, have shown a gradual decrease of the partial second generation from 1937 to 1939. The data indicate that the second generation is of importance only in certain years, the decrease having been closely related to a similar decrease of the mean daily temperature over these years.

Transference of hessian fly resistance and other characteristics of Marquillo spring wheat to winter wheat, R. H. PAINTER, E. T. JONES, C. O. JOHNSTON, and J. H. PARKER. (Coop. U. S. D. A.). (Kansas Sta. Tech. Bul. 49 (1940), pp. 55, figs. 18).—The hessian fly resistance of Marquillo spring wheat has now been transferred to winter wheats by means of crossing. These Marquillo hybrids are important for two reasons: (1) They are the first winter wheats to show marked resistance to the hessian fly in experimental tests in both hard and soft wheat belts wherever so far tested; and (2) they have given several different combinations of resistance to fly, tolerance to jointworm, resistance to leaf rust, stem rust, bunt, and mildew. Preliminary data indicate that they (particularly various lines of Marquillo × Oro and Marquillo × Tenmarq) may equal or excel the yield of standard varieties of winter wheats such as Turkey and Tenmarq.

Fly resistance derived from Marquillo was incidentally carried over from the durum parent along with stem rust resistance, for which the cross was originally made. The fly resistance tends to be recessive, although apparently more than one genetic factor is involved. In hybrids there was no evidence of linkage between fly resistance and resistance to disease, winter hardiness, spring or winter habit of growth, or other visible agronomic characters on which records were taken. The total difference in fly resistance between Marquillo or its hybrids and susceptible winter wheat varieties appears to be the result of the interaction between three or more separate heritable mechanisms: Low larval survival, ability to withstand infestation, and under some conditions low oviposition.

Midge control by soil fumigation, W. E. BRAUVELT. (Cornell Univ.). (*Amer. Rose Ann.*, 1940, pp. 108-110).—In the preliminary tests of soil fumigants here reported, in which naphthalene, paradichlorobenzene, nicotine, carbon disulfide, ethylene dichloride, dichloroethyl, and the proprietary products Soilogen, Astogen, and Fumogen were used, dichloroethyl ether was found to be the most promising material, considering effectiveness, safety to the plant, cost, and other factors.

The Rocky Mountain "black fly" *Symphoromyia atripes* (Diptera: Rhagionidae), H. H. ROSS (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 2, pp. 254-277, figs. 9).

The genus *Sympycnus* in Utah (Dolichopodidae: Diptera), F. C. HARMSTON and G. F. KNOWLTON. (Utah Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 2, pp. 395-403, figs. 28).

The growth of the head capsule of the Japanese beetle larva, D. LUDWIG and W. F. ABERCROMBIE (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 2, pp. 385-390, figs. 2).

Investigations of the parasites of *Popillia japonica* and related Scarabaeidae in the Far East from 1929 to 1933, inclusive, T. R. GARDNER and L. B. PARKER (*U. S. Dept. Agr., Tech. Bul.* 738 (1940), pp. 36, fig. 1).—This report, covering the work of the 5-yr. period from 1929 to 1933, inclusive, in Japan, Chosen (Korea), India, and Taiwan (Formosa), supplements earlier reports (*E. S. R.*, 70, p. 511). It presents additional information relative to the parasites previously listed, as well as accounts of other species found attacking the genus *Popillia*. Investigations were also made of parasites of the oriental beetle, Asiatic garden beetle, and *Serica peregrina* Chapin, 3 additional beetles that have become established in the northeastern part of the United States in recent years. Four species of Tachinidae and 1 of Pyrgotidae parasitic on adult *Popillia* beetles and 2 species of Dextidae and 5 of Scolidae parasitic on the larvae of *Popillia* were investigated. Investigations were carried on with a large number of *Tiphia* parasitic on the grubs of *Anomala* and *Serica*, but only 11 species were considered of sufficient importance to warrant introduction into the United States against the oriental beetle, Asiatic garden beetle, and *S. peregrina*. Large shipments of these parasites in the adult and immature stages were sent to the United States.

Two new spore-forming bacteria causing milky diseases of Japanese beetle larvae, S. R. DUTKY. (U. S. D. A. and N. J. Expt. Stas.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 1, pp. 57-68, figs. 6).—Two spore-forming bacteria responsible for type A and type B milky diseases of the larvae of the Japanese beetle, respectively, are described as *Bacillus popilliae* n. sp. and *B. lentimorbus* n. sp. They produce a disease condition in the larvae of the Japanese beetle that is not readily distinguishable on gross examination. Only the type A organism has as yet been cultured on artificial mediums.

Status of the milky diseases of Japanese beetle larvae, R. T. WHITE. (U. S. D. A.). (*Turf Cult.*, 2 (1940), No. 2, pp. 84-87, fig. 1).

The feeding of ground beetles, W. W. SHOUGH (*Amer. Midland Nat.*, 24 (1940), No. 2, pp. 336-344).—Cage observations of the feeding habits of carabid or ground beetles, largely predaceous, are reported. It was observed that among the types of living animal food offered, the beetles had little or no food selectivity. Any form that can be penetrated is eaten, although larval forms are given a wide preference, due, it is believed, to ease of capture and softness of body. Certain of the beetles, notably *Calosoma* sp. and *Pasimachus* sp., are definitely carnivorous; others, as *Harpalus* sp., *Evarthrus sodalis*, and *Nothopus grossus*, feed to a varying extent on plant food, though none seek plant food exclusively.

A revision of the North American Necydalini (Coleoptera: Cerambycidae), E. G. LINSLEY. (Univ. Calif.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 2, pp. 269-281).

A new species of *Hippodamia* from Mt. Rainier (Coleoptera: Coccinellidae), P. H. TIMBERLAKE (Calif. Citrus Expt. Sta.). (*Hawaii. Ent. Soc. Proc.*, 10 (1938), No. 2, pp. 265, 266).—A coccinellid from Longmire Springs, Mt. Rainier, Wash., is described as *H. washingtoni* n. sp.

Two new species of *Batrissodes* from South Carolina (Coleoptera: Pselaphidae), M. W. SANDERSON. (Univ. Ark.). (*Ent. News*, 51 (1940), No. 6, pp. 169-172).

The bionomics of the yam beetle *Galerucida bicolor* (Hope), a pest of cultivated yam in S[outh] India, T. V. R. AYYAR (*Jour. Bombay Nat. Hist. Soc.*, 41 (1940), No. 4, pp. 874-876, pl. 1).

Relative prevalence of potato flea beetle injuries in fields adjoining uncultivated areas, D. O. WOLFENBARGER. (U. S. D. A.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 2, pp. 391-394, fig. 1).

Experiments in Great Britain with wood preservatives for the prevention of *Lyctus* attack, F. R. CANN (*Forestry*, 14 (1940), No. 1, pp. 27-37).—An investigation aimed at determination of the value of water-soluble salts and other preservatives for the prevention of damage by *Lyctus* powder-post beetles in the sapwood of hardwoods is reported. The different types of preservatives and their suitability for the prevention of *Lyctus* are briefly discussed. Materials, methods of treatment, and testing technic are described and classified under the headings effective and ineffective. It is shown that water-soluble preservatives are effective only when applied by an impregnation treatment. Certain preservatives of the oil and solvent types are effective when applied by short-period dipping treatment.

Uninfected elm wood as a source of the bark beetle *Scolytus multistriatus* Marsham carrying the Dutch elm disease pathogen, D. L. COLLINS, K. G. PARKER, and H. DIETRICH ([*New York*] *Cornell Sta. Bul.* 740 (1940), pp. 14, fig. 1).—Of collections made in the field in southeastern New York State, as high as 15 percent of the specimens of the smaller European elm bark beetle, now generally considered to be the most effective agent in its transmission in the United States, were found, by culturing, to be carrying the Dutch elm disease fungus *Ceratostomella ulmi*. When cultured directly after emerging from diseased wood, as high as 100 percent of the beetles were positive for this fungus, but usually they averaged considerably less than 50 percent. "When beetles were artificially infested with spores and allowed to enter healthy wood, as high as 74 percent of their progeny emerged carrying spores of *C. ulmi*. Healthy cut logs exposed to normal beetle attack in the field produced as high as 62 percent of positive beetles in the progeny of parents which probably averaged much lower when entering. Pieces of uninfected beetle wood found in the field produced as high as 25 percent of positive beetles. Uninfected elm wood in farmers' wood piles also produced positive beetles. Diseased wood cut in short lengths and piled produced as high as 16 percent of positive beetles when stored out-of-doors and as high as 9 percent when stored in sheds. Healthy wood cut and stored in a similar way, but subjected to entry by spore-bearing beetles, produced 14 percent of positive beetles when stored out-of-doors and 19 percent when stored in a shed." The findings indicate that dead or dying elm wood of whatever origin, if suitable for the breeding of the smaller European elm bark beetle, is a potential source of inoculum from which this fungus may be spread by emerging beetles. Since the beetles can carry the fungus into uninfected wood and their progeny can carry it out, such wood serves as a reservoir for continuing local dissemination of the disease organism. It may also act as a bridge for the transfer of the fungus from the disease area to regions where the disease does not occur.

The shot hole borer *Anisandrus pyri* (Peck) in British Columbia (Coleoptera: Scolytidae), W. G. MATHERS (*Canad. Ent.*, 72 (1940), No. 10, pp. 189, 190).

Longevity and egg production in the common bean weevil (*Acanthoscelus obtectus* (Say)), R. J. BUSHNELL and D. C. BOUGHTON. (Univ. Conn. et al.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 2, pp. 361-370, figs. 3).

A new Fijian Diathetes injurious to *Pandanus* (Coleoptera: Curculionidae), E. C. ZIMMERMAN (*Hawaii. Ent. Soc. Proc.*, 10 (1938), No. 2, pp. 335-338, figs. 2).—*D. pandanae*, the larvae of which were taken from the trunk and limbs of a *Pandanus* tree near Loma Loma, Lau Province, Fiji, in August 1938, is described as new. That it may become a pest of considerable economic importance is indicated since the fruits are eaten by some people, the fibers of the aerial roots are used for cordage, and the wood itself is used in various ways. In some islands probably one of the most important sources of monetary income is the sale of *Pandanus* mats and other plaited goods.

Biochemical aspects of the differentiation of the female honeybee (*Apis mellifera* L.), R. M. MELAMPY, E. R. WILLIS, and S. E. MCGREGOR. (U. S. D. A. and La. State Univ.). (*Physiol. Zool.*, 13 (1940), No. 3, pp. 283-293, figs. 7).—The findings in a differential study of the female castes of the honeybee from the biochemical standpoint show that the queens and workers have the same approximate growth rate during early larval life, and then the growth of the worker caste is retarded, as indicated by the nitrogen, total lipid, total reducing substance (calculated as glucose), and calorific value. A list of 36 references to the literature cited is included.

Studies on the poison system of the honeybee, J. E. ECKERT. (Univ. Calif.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 2, pp. 258-268, figs. 12).

Environmental resistance to the establishment of parasitic Hymenoptera, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 2, pp. 245-253).—It is shown that the establishment of parasitic Hymenoptera may be resisted by environmental factors which affect the activity of the ovipositing females or the development of their progeny. A parasitic species may fail to become established because it does not frequent host habitats or because it frequents habitats which lack hosts. The use of insecticides may reduce the host density below that required for the maintenance of the parasite population. Establishment may fail if the deposition of fertilized eggs of colonized adult parasites is inhibited by a change in condition of the host, the presence of predators, or the lack of food, or if the development of the parasite progeny is inhibited by the unsuitability of its normal host or by the competition of other parasites, either primary or secondary. The contribution is presented with a list of 27 references to the literature cited.

Some egg parasites of *Oecanthus quadripunctatus* Beut. and of a species of *Orchelimum*, E. J. UDINE and J. S. PINCKNEY. (U. S. D. A.). (*Pa. Acad. Sci. Proc.*, 14 (1940), pp. 81-84).—In the search for other hosts of some of the parasites of the hessian fly, various insects which in some stage of their development resembled the hessian fly puparium were reared at the Carlisle, Pa., laboratory. Notable among these was the four-spotted tree cricket, the eggs of which were found in abundance in the stems of wild carrot, or Queen Anne's lace (*Daucus carota*). From a total of 5,849 eggs of this cricket reared from various localities in Pennsylvania, Virginia, and North Carolina, nine species of parasites were obtained, namely, *Cacellus oecanthi* (Riley), *Leptoteleia oecanthi* (Riley), *Polynema bifasciatipenne* Gir., *Tetrastichus* sp., *T. oecanthivorus* compar Gahan, *Hupelmus* n. sp., *E. allynii* French, *Eurytoma* sp., and *Macrorileya oecanthi* Ashm. Eggs of an unidentified species of *Orchelimum* were also collected, though less

abundantly, from the stems of wild carrot. From the 153 eggs reared from localities in Pennsylvania and Virginia, four species of parasites were obtained, namely, *Eupelminus* sp., *Tumidiscapus orchelimumis* Gahan, *Eupelmus* n. sp., and *Macroteleia* n. sp. The distribution and abundance of the parasites, tabulated by localities, is shown in accompanying tables. *H. allyni* was the only species parasitic on the hessian fly that was reared from the eggs of the two orthopterons.

A revision of the Pimplini of eastern North America (Hymenoptera: Ichneumonidae), H. K. TOWNES, JR. (Cornell Univ.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 2, pp. 283-323, figs. 10).

The hornworm parasite *Apanteles congregatus* Say and the hyperparasite *Hypopteromalus tabacum* (Fitch), B. B. FULTON. (N. C. Expt. Sta.). (*Ann. Ent. Soc. Amer.*, 33 (1940), No. 2, pp. 231-244, figs. 3).—Report is made of a study of *A. congregatus*, a common braconid parasite of Sphingidae and an important enemy of the tomato worm, the percentage of parasitism of hornworms by which increases during autumn. This parasite "deposits a large number of eggs in the host in a few seconds. The eggs increase greatly in size before hatching. There are two larval instars in the host. During the first instar the larvae increased five-fold in dimensions. The second instar larvae molt as they are leaving the host. The third instar larvae spin cocoons on the host. Until about October 1 the pupae are formed in a few days; after that time the larvae hibernate and pupate in the spring. Several species of hyperparasites were reared from *Apanteles* cocoons. The most important enemy of *Apanteles* in tobacco fields is *H. tabacum*, which may almost eliminate the primary parasite in certain fields in late fall. Its larvae feed externally on *Apanteles* larvae within the cocoons."

Some parasites and hyperparasites of the cecropia moth, O. P. BRELAND (*Jour. N. Y. Ent. Soc.*, 48 (1940), No. 3, pp. 259-264).

Anystis agilis Banks, a predacious mite on eggs of the artichoke plume moth, W. H. LANGE, JR. (*Pan-Pacific Ent.*, 16 (1940), No. 1, p. 30).

The tropical rat mite *Liponyssus bacoti* in Minnesota, W. A. RILEY. (Univ. Minn.). (*Jour. Parasitol.*, 26 (1940), No. 5, p. 433).

ANIMAL PRODUCTION

[Abstracts of papers on animal nutrition presented at the seventh annual meeting of the American Institute on Nutrition] (*Jour. Nutr.*, 19 (1940), No. 6, Sup., pp. 7, 11, 13, 14, 15, 17, 18, 19, 20).—Abstracts of the following papers are noted: Pantothenic Acid and Its Nutritional Significance, by R. J. Williams; Comparative Activities of Certain Anthemorrhagic Quinones, by H. J. Almquist and A. A. Klose (Univ. Calif.); Muscular Dystrophy in Rabbits and the Autoxidation of Animal Fats, by H. A. Mattill; Relation of Perosis to Unrecognized Vitamins, by A. G. Hogan, L. R. Richardson, and H. Patrick (Univ. Mo.); A Deficiency Disease in Chicks Prevented by *dl*-alpha Tocopherol, by H. R. Bird and T. G. Culton (Univ. Md.) (*E. S. R.*, 88, p. 812); Studies of the Vitamin B-Complex With Chicks, by T. H. Jukes, and Anti-grey Hair Vitamin Deficiency in Dogs and Silver Foxes, by A. F. Morgan (both Univ. Calif.); and Availability of Phosphorus in Hays, by D. E. Williams, F. L. MacLeod, E. Morrell, and H. R. Duncan (Univ. Tenn.).

[Livestock investigations in Pennsylvania] (*Pennsylvania Sta. Bul.* 399 (1940), pp. 34-40, 54-56, figs. 2).—Studies for which results are briefly noted include a comparison of corn silage, alfalfa hay, and alfalfa-molasses silage as roughages for fattening steers, by F. L. Bentley and P. T. Ziegler; breeding superior type lambs for hothouse lamb production, by W. L. Henning; optimum

protein levels for growing fattening pigs, by T. B. Keith and R. C. Miller; pumping as an aid in the pickle curing of hams, and the curing of frozen hams, both by Ziegler; the destruction of vitamin C during bovine digestion, by C. A. Knight, R. A. Dutcher, N. B. Guerrant, and S. I. Bechdel; the function of manganese in animal nutrition, the synthesis of vitamin C by rats, and the effect of exercise on the vitamin B₁ requirements of rats, all by Guerrant; the effect of anterior pituitary extract on energy and protein metabolism, and methods of computation of energy factors, both by M. Kriss and L. F. Marcy; the dynamic effects of protein, carbohydrate, and fat, by E. B. Forbes, J. W. Bratzler, et al.; the relation of protein to heat production, by Forbes; and measurement of spoilage of certain edible fats, by M. L. Shaner and H. O. Tiebold.

From poultry investigations, results are noted on the inheritance of egg shape, by D. R. Marble; the value of whole oats for turkeys, by P. H. Margolf; the vitamin A requirements of chicks, the riboflavin requirements of White Leghorn and Barred Plymouth Rock chickens, and the value of molasses as a partial substitute for corn in chick rations, all by R. V. Boucher; and the use of dried yeast to reduce the incidence of perosis.

Feeding farm livestock, E. W. SHEETS (*Chicago: Breeder Pubs.*, [1940], pp. 192, figs. [31]).—Practical directions are given for livestock feeding.

The impairment in nutritive value of corn grain damaged by specific fungi, H. H. MITCHELL and J. R. BEADLES. (Ill. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 2, pp. 135-141).—The fungi used in this study were *Diplodia zeae*, *Fusarium moniliforme*, and *Gibberella zeae*. Ears of corn were artificially inoculated with pure spores of these organisms. Corn showing damage of 94-98, 100, and 53 percent by *Diplodia*, *Fusarium*, and *Gibberella* organisms, respectively, were used in the analytical studies and the paired rat feeding tests. Damage to corn by *Diplodia* ear rot or *Fusarium* ear rot definitely reduced the digestibility of the nitrogen and energy and the nutritive value of the protein and energy for promotion of growth in the rat. Damage of the latter type appeared somewhat more severe. Infection with any of the organisms caused definite changes in the chemical composition of corn, particularly loss of the ether-extractable constituents. A sample of corn containing 53 percent of kernels damaged by the *Gibberella* organism proved extremely toxic to young albino rats.

Stabilization of iodine in salt and feedstuffs, F. F. JOHNSON and E. R. FREDERICK (*Science*, 92 (1940), No. 2388, pp. 315, 316).—The newly devised method for stabilizing the iodine supplement of comestibles consists of milling 100-mesh alkali iodide with a small amount of nontoxic metallic soap. When 92 parts of potassium iodide were milled with 8 parts of calcium stearate, a stable free-flowing powder, coated with the stearate and practically insoluble in water, resulted. Loss of iodine from mineralized salt containing the stearate-coated iodide was very little as compared with the loss from the same formula without the calcium stearate. The stearate also functioned to prevent caking of table salt when used at a 0.2-percent level.

Vitamin content of distillers' by-products, C. S. BOBUFF, A. F. LANGLYKKE, and S. BLACK. (Univ. Wis. et al.). (*Indus. and Engin. Chem.*, 32 (1940), No. 9, pp. 1237-1239, fig. 1).—Three feed products representing distillers' residues including (1) the insoluble portion removed on screens, (2) the insoluble fraction removed by centrifuges, and (3) a soluble fraction removed by evaporating the thin slops, were assayed. The dried centrifuge sludge was relatively poor in water-soluble vitamins. The dried sirup contained from 26 to 40 µg. of flavin and from 2 to 3 International Units of vitamin B₁ per gram, also a significant amount of the chick antidermatitis factor and factor W. A composite sample of the feed contained only small amounts of vitamins A and D, but from 13.3 to

15 μ g. of riboflavin and from 1 to 1.3 I. U. of vitamin B₁ per gram, as well as sufficient chick antidermatitis factor to protect chicks at a feeding level of from 30 to 40 percent.

Factors affecting the stability and estimation of carotene in artificially dried grass and hays, S. K. KON and S. Y. THOMPSON (*Jour. Agr. Sci. [England]*, 30 (1940), No. 4, pp. 622-638, figs. 3).—The loss of carotene in finely ground, artificially dried grass amounted to about 23.9 percent during the first month of storage and 31.4 percent over a 6-mo. period (August to February). Little difference in rate of loss was noted between samples stored in the light v. the dark, at ordinary temperature v. 70° to 80° F., and in paper bags v. jute bags. The carotene loss in baled artificially dried grass amounted to from 30 to 40 percent over a period of 13 months' storage. Methods of estimating carotene in forage are discussed.

The hematology of avitaminosis A in dogs and rabbits, M. W. EMMEL (Fla. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 761, pp. 145-148, figs. 2).—Three groups of young pups were fed on vitamin A-deficient, low vitamin A, and adequate vitamin A diets, respectively. Those on the deficient diet developed acute A avitaminosis after 9 weeks, at which time the normal numerical relationship of small to large lymphocytes was reversed. Those on the low vitamin A intake for 18 weeks developed mild symptoms of vitamin A deficiency and showed an increase in total lymphocyte count, with a preponderance of the large lymphocytes. The normally fed controls showed no significant blood changes. When 37,500 International Units of vitamin A in shark-liver oil were fed on alternate days to the deficient groups, the deficiency symptoms disappeared within 2 weeks and a normal blood picture was restored in 4 weeks. Rabbits of varying ages subjected to vitamin A-deficient feeding all exhibited blood counts indicative of chronic vitamin A deficiency. Blood counts returned to normal within 7 weeks when 7,500 I. U. of vitamin A in shark-liver oil daily was added to the diets.

Directions for the ascorbic acid therapy of slow-breeding bulls, P. H. PHILLIPS (Univ. Wis.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 761, pp. 165, 166).—It is reported that the subcutaneous injection of ascorbic acid (E. S. R., 84, p. 173) caused marked recovery in from 60 to 75 percent of the impotent bulls which were so treated. The response to ascorbic acid therapy may be in the form of greater sexual interest or more viable sperm, or both. Distinct improvement of the semen generally occurred. The recommended treatment consists in dissolving from 1 to 2 gm. of crystalline ascorbic acid in from 5 to 10 cc. of sterilized buffer solution (distilled water or physiologic saline solution may be used) and injecting the ascorbic acid solution subcutaneously at from 3- to 4-day intervals for 5 or 6 weeks, or until the bull shows definite improvement.

Legume and grass silage for beef cattle, K. L. TURK (*Md. Agr. Soc., Farm Bur. Rpt.* 24 (1939), pp. 219-224).—A general discussion regarding the preparation and use of such silage.

Beet-top silage for fattening steers, F. W. CHRISTENSEN (*North Dakota Sta. Bimo. Bul.*, 3 (1940), No. 2, pp. 3-5).—Study of the comparative gains of 1,000-lb. steers on an 82-day feeding trial suggested that good clean beet-top silage was worth from one-third to one-half as much as corn silage.

History of the breeds of cattle in Canada [trans. title], L. DE G. FORTIN (*Bonne Terre*, 18 (1940), pp. [357], figs. 57).—Principal sections of this treatise include the history of the cattle breeds in Canada, formation and preservation of the breeds, and improvement of the cattle.

Levels of protein for pigs, T. B. KEITH and R. C. MILLER (*Pennsylvania Sta. Bul.* 401 (1940), pp. [2]+22, figs. 7).—There are reported the results of experi-

ments in which swine were fed on corn supplemented with soybean meal, tankage, and alfalfa meal to provide mixtures containing 10, 12, 15, 17, 20, 22, 25, and 27 percent protein. The results summarized for rate and economy of gains for different weight intervals showed the higher protein levels to stimulate the more rapid gains in the younger animals, but under certain conditions of high-priced protein and low-priced corn the 17-percent protein ration was most economical. Above 125 lb. live weight, 15-percent protein rations were most economical, but the amount of protein recommended for weight above 100 lb. depends on the use to be made of the pigs. Cod-liver oil was added as a supplement to rations containing 15 percent protein, with the result that the average daily gains were less rapid. The feed requirements were also greater with the cod-liver oil.

A series of nomographic tables is presented for ready calculation of the costs per 100 lb. of gain at different prices for the feeds included.

Growth rate and carcass quality in bacon pigs: A study of polynomial coefficients fitted to growth rate data, H. P. DONALD (*Jour. Agr. Sci. [England]*, 30 (1940), No. 4, pp. 582-597, fig. 1).—A statistical analysis of growth data and carcass reports for 75 bacon-type pigs are described. By means of standard partial regression coefficients, the dependence of each of six carcass measurements on growth rate, rate of change of growth rate, carcass weight, and weaning weight was determined. The various degrees of correlation are described at length. It is concluded that, since the influence of growth rate on carcass measurements appears to be expressed in a variable way according to the type of pig concerned, it is not possible to make detailed predictions of the relation between growth rate and carcass quality.

The "restricted" feeding of bacon pigs: A co-ordinated experiment at centres in Great Britain and Ireland, R. W. SHORROCK (*Jour. Agr. Sci. [England]*, 30 (1940), No. 4, pp. 598-621).—In 22 uniform experiments, bacon pigs were fed in all cases at a uniform rate to 100 lb. live weight and at 3 levels of feeding thereafter. Restricting the daily feed intake to 5 lb. 3 oz. per head increased the efficiency of feed utilization with no pronounced effect on carcass quality as compared with the feeding of 6 lb. 5 oz. or 7 lb. 8 oz. per head daily. The feed saving between the lowest and highest levels amounted to 50 lb. per head over the period from 100 to 200 lb. live weight.

The quality of hams and bacons prepared from carcasses of hogs fed with different feed mixtures, D. S. BOLONG (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 4, pp. 321-333, pls. 3, fig. 1).—Four pairs of pigs were fed rice bran plus (1) kitchen refuse, (2) corn meal, (3) copra meal, and (4) a balanced mixture including corn meal, copra meal, and tankage over a fattening period of 285 days. Studies were conducted on the cured hams and bacons. Feed mixture 3 containing an excess of copra meal resulted in relatively slow growth and in the production of soft oily fat. Well-marbled meat of good quality was produced by all other lots. The highest shrinkage during drying, smoking, aging, and cooking occurred in the lot fed rice bran and copra meal, while the least shrinkage occurred in meat obtained from animals fed the balanced mixture. The meat from lot 4 also contained the highest percentage of protein and yielded the most savory finished product.

Rabbit feeding for meat and fur, W. KING WILSON and W. MCCARTNEY (*Imp. Bur. Anim. Nutr. [Aberdeen], Tech. Commun. 12* (1940), pp. 36).—General principles of feeding, with special reference to the nutrient requirements by rabbits of different size and for the production of meat and skins.

[Poultry Science Association, thirty-second annual meeting] (*Poultry Sci.*, 19 (1940), No. 5, pp. 345, 346, 347, 348-352, 353, 354, 355-361, 362, 363, 364,

365, 366).—Abstracts of the following papers presented before the meeting held at Ithaca, N. Y., June 26-29, 1940, are noted: The Vitamins, by R. M. Bethke (Ohio Expt. Sta.); Influence of the Rations of the Hens Upon the Vitamin A and Riboflavin Content of the Eggs and Tissues, by B. Bisbey, A. Weis, and H. L. Kempster (Univ. Mo.); Composition and Quantity of Feed Consumed by Laying Hens Versus Composition and Quantity of Body Fat and Eggs Produced, by G. D. Buckner, W. M. Insko, Jr., and A. Harms (Ky. Sta.); Premature Expulsion of Eggs by Hens Injected With Posterior Pituitary Substances, by W. H. Burrows and T. C. Byerly (U. S. D. A. and Univ. Md.); The Physical Character of Poultry Droppings as Affected by Various Feed Ingredients, by L. E. Card and B. R. Burmester (Ill. Sta.); The Body Weights and Measurements of Purebred and Crossbred Turkeys, by T. B. Clark, T. D. Runnels, and E. A. Livesay (W. Va. Sta.); The Effect of Some Riboflavin Supplements on Chick Growth and Curled-Toe Paralysis, by T. G. Culton and H. R. Bird (Univ. Md.); Physical Measurements of Carcass Quality in Roasters, by R. L. Dolecek, W. O. Wilson, and W. E. Poley (S. Dak. State Col.); The Effect of Pregnant Mare Serum on Rate of Yolk Production in Domestic Fowl, by R. M. Fraps (U. S. D. A.); The Vitamin D Requirements of Ducklings, by J. C. Fritz, W. Archer, and D. Barker; Congenital Goiter in Chicks, and The Relationship of the Thyroid to the Thymus in the Chick, both by F. X. Gassner and H. S. Wilgus, Jr. (Colo. Sta.); Flowers of Sulphur and Charcoal in the Control of Experimentally Produced Coccidiosis, by O. E. Goff and C. W. Upp (La. Sta.); Breed Differences in Thick Albumen Content of Fresh-Laid Eggs, by C. D. Gordon, A Comparative Cost Study of Egg Prices Under Various Systems of Procurement and Sale, by H. G. F. Hamann, and The Composition of Turkeys as Affected by Age and Sex, by H. M. Harshaw and R. R. Rector (all U. S. D. A.); Transmitting Ability in Males of Genes for Egg Size, by F. A. Hays (Mass. Sta.); The Supplementary Effect of Cystine and Methionine Upon the Protein of Raw and Cooked Soybeans as Determined With Chicks and Rats, by J. W. Hayward and F. H. Hafner; The Efficiency of Feed Utilization by Barred Plymouth Rock and Crossbred Broilers, by C. W. Hess, T. G. Byerly, and M. A. Jull (Univ. Md.); The Proteins, by G. [F.] Heuser (Cornell Univ.); Vitamin B₂ and Chick Nutrition, by A. G. Hogan, L. R. Richardson, H. Patrick, B. L. O'Dell, and H. L. Kempster (Univ. Mo.); Do Turkey Eggs Need To Be Turned During the Latter Stages of Incubation? by W. M. Insko, Jr., and A. T. Ringrose (Ky. Sta.); Autosexing Accuracy—Effect of Barring Gene in Red to Black Down-Color Phenotypes, by R. G. Jaap (Okla. Sta.); Effect of Date of Hatch on Egg Weight, by F. P. Jeffrey (N. J. Stas.); Vitamin A Requirements of Growing Chicks as Determined by Nasal Histology, by E. Jungherr and K. C. Seeger (Univ. Conn.); A New Lethal Mutation in Fowl and Its Theoretical Significance, and The Effect of Estrogen Administration on Blood Calcium, Bone Formation, and Blood Fat in Cocks and Drakes, both by W. Landauer ([Conn.] Storrs Sta.); Factors Affecting the Duration of the First Annual Rest, by I. M. Lerner and L. W. Taylor (Univ. Calif.); The Effect of Lights on the Fecundity of Turkeys, by P. H. Margolf (Pa. State Col.); The Effect of Anterior Pituitary Extract Upon Vitamin A and Fat Metabolism in the Growing Chick,—II, The Influence of Dehydrated Grass in the Rations, by W. A. Maw, N. Nickolaiczuk, T. M. MacIntyre, W. E. Parker, F. P. Griffin, W. D. MacFarlane, and J. B. Collip; Poultry and Egg Marketing Research in the North Central States, by C. G. McBride (Ohio State Univ.); Heart Rate of the Adult Domestic Fowl, by E. H. McNally (U. S. D. A.); The Relation Between Specific Gravity of the Egg and Its Hatching Power, by

S. S. Munro; Viability and Weight of Chicks as Affected by Shipping and Time of Feeding, by M. W. Olsen and B. Winton (U. S. D. A.); Factors Affecting the Canded and Broken-Out Appearance of Fresh White-Shell Eggs, by N. G. Paulhus and J. M. Gwin (Univ. Md.); Results of a 10 Year Study of the Influence of Artificial Light on Egg Production, by R. Penquite and R. B. Thompson (Okla. A. and M. Col.); Progeny Testing in the Breeding of Pigeons, by C. S. Platt (N. J. Stas.); The Effect of Selenized Grains on the Rate of Growth of Chicks, by W. E. Poley, W. O. Wilson, and A. L. Moxon (S. Dak. State Col.); Factors That Determine Earnings on Connecticut Poultry Farms, by P. L. Putnam (Univ. Conn.); Relationships Between Certain Physical Measurements Upon Fresh and Stored Eggs and Their Behavior in the Preparation and Baking of Cake, by W. E. Pyke and G. Johnson (Colo. Sta.); Inheritance and Variation of Blood Spots in Chicken Eggs, by J. P. Quinn and A. B. Godfrey, and Diurnal Variations in Spermatogenic Activity in the Domestic Fowl, by G. M. Riley (both U. S. D. A.); Oxygen Consumption as a Diagnostic Symptom of Functional Disturbances of the Embryo, by A. L. Romanoff ([N. Y.] Cornell Sta.); Comparison of Animal and Vegetable Protein Concentrates, Singly and Combined, in Chick Rations, by T. D. Runnels, T. B. Clark, and A. H. VanLandingham (W. Va. Sta.); Viability of Spermatozoa of the Chicken Under Various Environmental Conditions, by C. S. Shaffner, E. W. Henderson, and C. G. Card (Mich. State Col.); The Minerals, by P. J. Schaible, and The Effect of Mineral Supplements on the Availability of Manganese, by P. J. Schaible and S. L. Bandemer (both Mich. Sta.); The Use of Distillers By-Products in Poultry Rations, by H. J. Sloan (Univ. Minn.); Growth Factors Required by Chicks, by R. A. Sullivan; Marketing Problems in Deficit Production Areas, by J. L. Tennant (R. I. State Col.); The Economic and Statistical Significance of Longevity Egg-Yield Performance Records, by W. C. Thompson (N. J. Stas.); The Use of Artificial Insemination in Progeny Testing, by D. C. Warren and C. L. Gish (Kans. Sta.); The Proposed Breeding Program of the Regional Poultry Research Laboratory, by N. F. Waters and J. H. Bywaters (U. S. D. A.); and The Goitrogenicity of Soybeans, by H. S. Wilgus, Jr., F. X. Gassner, A. R. Patton, and R. G. Gustavson (Colo. Sta. et al.).

Poultry breeding, M. A. JULL (*New York: John Wiley & Sons; London: Chapman & Hall, 1940, 2. ed., pp. XIV+484, figs. 76*).—A revised edition of the book previously noted (E. S. R., 69, p. 411).

Methods for determining the relative value of proteins for chickens, A. H. VANLANDINGHAM and T. B. CLARK. (W. Va. Univ.). (*W. Va. Univ. Bul., 40. ser., No. 5-1 (1939), p. 89*).—A brief report of nitrogen balance trials with chickens receiving single protein supplements as the primary source of protein in the diet. The percentage nitrogen retention was approximately the same on a normal mixed ration and when dried whole egg was included in the basal diet. Fish meal and casein in the basal diet gave nitrogen retention values from about 10 to 15 percent less and meat scrap approximately 50 percent less than that obtained from the normal mixed ration.

Chicken and egg yolk fat, G. A. BUCKNER, W. M. INSKO, JR., J. H. MARTIN, and A. HARMS. (Ky. Expt. Sta.). (*Amer. Egg and Poultry Rev., 1 (1940), No. 7, p. 270*).—When hens of the Rhode Island Red breed were fed rations varying from 5.9 to 38 percent starch, the quantity of body reserve fat decreased with the percentage of starch in the ration but the percentage of yolk fat and the hatchability of the eggs were not influenced materially (E. S. R., 83, p. 388).

The tolerance of growing chicks for soybean oil in their ration, E. W. HENDERSON and W. E. IRWIN. (Iowa Expt. Sta.). (*Poultry Sci., 19 (1940),*

No. 6, pp. 389-395, figs. 5).—Varying amounts of soybean oil added to the basal ration of chicks up to 8 weeks of age were found to have no significant effects on growth rate until the rations contained over 10 percent of oil. There were proportionate decreases in weight as larger amounts of oil were present. No significant differences in the weights of the livers, volume of gall bladder, or histological sections of the livers were noted. The iodine numbers of the fat from birds on the higher oil rations ranged from 74 ± 0.64 for those having no oil to 120 ± 0.64 for those on rations with 22 percent of soybean oil. Excessive moisture and higher ether extract contents of the feces with abnormal molting were noted in the groups receiving more than 14 percent oil rations.

The effect of feeding wheat germ oil, I, II, C. E. HOLMES and W. W. CRAVENS. (Univ. Wis.). (*Poultry Sci.*, 19 (1940), No. 5, pp. 303-310, 311-314).—Two reports are noted.

I. *Egg production and hatchability*.—In trials involving both White Leghorn and Barred Plymouth Rock hens, the addition of cold-pressed wheat-germ oil at the rate of 0.5 cc. per bird daily to a well-balanced basal ration had no beneficial effect on egg production or fertility and hatchability of the eggs. It did not reduce embryonic mortality or improve the viability of the chicks hatched.

II. *Growth, age to sexual maturity, and egg production*.—In trials with growing White Leghorn chicks the addition of 0.1 percent of wheat-germ oil to the ration did not significantly affect growth, mortality, age to sexual maturity, or subsequent egg production.

Influence of wheat germ oil on semen production of cockerels, H. W. TRUS and W. H. BURROWS. (U. S. D. A.). (*Poultry Sci.*, 19 (1940), No. 5, pp. 295-298, fig. 1).—Four groups of 10 cockerels each were fed the same basal ration. Two groups received in addition 0.5 percent of wheat-germ oil, while the diet of the other two was treated with ferric chloride in ether. One group on each of the two modified diets received 100 mg. of desiccated thyroid, three times per week for the first 5 weeks of the 12-week experimental period. The feeding of the desiccated thyroid caused semen production to decrease steadily and at a fairly uniform rate, with this trend continuing for several days after this treatment was discontinued. The addition of wheat-germ oil to the diet caused a marked decrease in semen production. Treatment of the diet with ferric chloride had little, if any, effect on semen production.

Correlation of egg production with vitamin A, ascorbic acid, mineral reserves, and body weight of laying hens, A. D. HOLMES, F. TRIPP, and G. H. SATTERFIELD. (Univ. N. C. et al.). (*Poultry Sci.*, 19 (1940), No. 6, pp. 485-492).—Study was made of the body weights, vitamin A, ascorbic acid, and mineral reserves of Rhode Island Red pullets fed individually in batteries for 1 yr., with reference to groups producing from 230 to 315, 163 to 197, and 66 to 153 eggs each. Although variations between the composition of the livers and bones of the birds in the different groups were apparent, the high nutritive value of the ration did not permit wide differences in the vitamin A, ascorbic acid, and mineral reserves associated with egg production.

The effect of vitamin A deficiency on malposition of the chick embryo, H. D. POLK and G. R. SIPE. (Miss. Expt. Sta.). (*Poultry Sci.*, 19 (1940), No. 6, pp. 396-400).—During a 3-yr. period, Rhode Island Red yearling hens on an all-mash ration of yellow and white corn, wheat shorts, and bran laid a total of 6,099 eggs. Hatching results with the fertile eggs showed that 8.4 percent produced embryonic malpositions. A corresponding group on the same ration to which 0.33 percent of cod-liver oil was added produced 8,306 eggs, and only 4.9 percent of their fertile eggs developed embryonic malformations. All

of the six types of malpositions but one were produced in greater numbers by those hens receiving the vitamin A-deficient rations than by hens fed adequate amounts of vitamin A. However, the incidence of chicks in the abnormal positions was not related to the quantity of vitamin A in the ration.

Vitamin deficiency and abnormal bone growth of the chick, A. G. HOGAN. (Univ. Mo.). (*Sci. Mo.*, 51 (1940), No. 4, pp. 389, 390).—A brief report, indicating the requirements of the chick for an antiperosis vitamin contained in an alcohol extract of liver and tentatively designated as vitamin B₇.

Correlation of avian diseases and the ascorbic acid content of chicken blood, G. H. SATTERFIELD, M. A. MOSELEY, H. C. GAUGER, A. D. HOLMES, and F. TRIPP. (Univ. N. C. et al.). (*Poultry Sci.*, 19 (1940), No. 5, pp. 337-344).—Determination of the ascorbic acid content of groups of diseased chicks, divided with reference to the incidence of specific types of diseases, gave the following mean values: Coccidiosis (cecal) 0.695 mg. percent, coccidiosis (small intestine) 0.825, fowl typhoid 0.714, parasites (internal) 0.689, pullorum disease 0.584, coryza 0.971, fowl pox 0.725, epidemic tremor 0.54, leucosis (lymphoid) 0.912, leucosis (myloid) 0.746, leucosis (iritis) 1.005, tumors 0.806, enteritis 0.919, gizzard injury 1.178, cyst (cloaca) 0.699, a crop-bound bird 1.446, avitaminosis A 1.202, poisoning 0.808, and undiagnosed conditions 0.663 mg. percent ascorbic acid. A mean value of 1.768 mg. percent ascorbic acid was found in normal birds as compared with 1.713 mg. percent in birds afflicted with neurolymphomatosis gallinarum (nerve type). From these findings it appeared impossible to correlate any specific avian disease with an abnormal amount of ascorbic acid in the blood plasma.

Studies on a growth factor present in polished rice and required by chicks on a simplified diet, E. L. R. STOKSTAD, P. D. V. MANNING, and R. E. ROGERS (*Poultry Sci.*, 19 (1940), No. 6, pp. 412-417).—The existence of a growth-promoting substance in the liver, kidney, and cereal products and not identical with α -tocopherol, arginine, or linoleic acid was demonstrated in three series of experiments with White Leghorn chicks. The dissimilarity of this substance and riboflavin was evident in that both were strongly linked with protein, but riboflavin was separated at boiling temperatures. The factor concerned was stable after autoclaving in an acid medium but only partially stable in a neutral or alkaline medium.

The effect of minerals and vitamin D on the percentage bone ash of young chicks, J. W. COOK and E. I. ROBERTSON. (Wash. Expt. Sta.). (*Poultry Sci.*, 19 (1940), No. 6, pp. 385-388, fig. 1).—Chicks on a normal diet were found to show increases in the bone ash of their tibias from 36.10 to 44.37 percent for their first 9 days, while during the same age period the bone ash of the tibias from chicks on a diet deficient in vitamin D and minerals decreased from 36.92 to 28.36 percent. Continuing these chicks until 15 days of age decreased the bone ash to 22.69, but an adequate diet during this period on previously depleted chicks increased the bone ash to 32.92 percent. The daily changes in the bone ash were based on an average analysis of the tibias of five chicks.

Effect of parathyroid preparation on the blood calcium of the fowl, T. B. AVERY, H. M. SCOTT, and R. M. CONRAD. (Kans. Expt. Sta.). (*Poultry Sci.*, 19 (1940), No. 5, pp. 321-323).—Both intramuscular and subcutaneous injections of parathyroid extract in amounts ranging up to 1.5 cc. per kilogram of body weight into chickens of different ages, sexes, and physical conditions failed to elevate the blood calcium of the birds.

Effect of parathyroid preparation on the calcium metabolism of the fowl, T. B. AVERY, H. M. SCOTT, and R. M. CONRAD. (Kans. Expt. Sta.).

(*Poultry Sci.*, 19 (1940), No. 5, pp. 324, 325).—Calcium balance experiments with molting hens, part of which received parathormone in initial injections of 1.5 cc. and 0.5 cc. per kilogram of body weight daily for 6 successive days, showed no significant difference in the calcium retention of the control and injected birds. Apparently injection of this preparation did not cause the molting hens to deplete the body of its calcium repositories.

Some properties of the alcohol-precipitate factor with further results of its effect on chicks and hens, A. E. SCHUMACHER and G. F. HEUSER. (Cornell Univ.). (*Poultry Sci.*, 19 (1940), No. 5, pp. 315-320).—Continuing the investigations of Bauernfeind and Norris (E. S. R., 82, p. 667), an alcohol-precipitate factor concentrate prepared from dried brewers' yeast was tested on growing chicks and laying hens. When added to the ration of chicks at a rate equivalent to 5 percent of dried yeast, either alone or in combination with riboflavin, it exerted a marked growth-stimulating effect. The effect of this factor in the absence of riboflavin was greater than that of riboflavin (400 γ per 100 gm. of ration) in the absence of the alcohol-precipitate factor. When included in the diet of laying hens this factor appeared to have a relatively greater effect than riboflavin upon the maintenance of body weight. Also, in comparison with riboflavin, it had a relatively greater effect upon egg production than upon hatchability. The factor which is water-soluble proved to be dialyzable, stable to boiling, and precipitated by 90 percent alcohol.

Is riboflavin synthesized in the feces of fowl? W. F. LAMOREUX and A. E. SCHUMACHER. (Cornell Univ.). (*Poultry Sci.*, 19 (1940), No. 6, pp. 418-423, fig. 1).—Observation indicated that more riboflavin was recovered from the feces than was included in a ration fed to growing chicks. It was further shown that the removal of the ceca from fowls did not lessen the riboflavin present. Further studies seemed to indicate rather definitely that the rapid synthesis of the riboflavin in the feces following defecation, makes it essential that coprophagy be prevented if study of the riboflavin synthesis in the digestive tract is concerned.

The effect of some riboflavin supplements on chick growth and curled-toe paralysis, T. G. CULTON and H. R. BIRD. (Md. Expt. Sta.). (*Poultry Sci.*, 19 (1940), No. 6, pp. 424-430, figs. 2).—Crossbred Barred Plymouth Rock \times New Hampshire chicks raised on a basal ration containing 175 μ g. of riboflavin per 100 gm. developed curled-toe paralysis in about 75 percent of the birds, with little retardation in growth up to 5 weeks. The growth rate was increased and the occurrence of curled-toe paralysis was reduced by supplying additional amounts of crystalline riboflavin, dried skim milk, or even by less completely extracted casein (using alcohol instead of water), but the curled-toe paralysis was not prevented by the addition of 300 μ g. of crystalline riboflavin per 100 gm. to the basal ration nor entirely by 400 μ g. of riboflavin in dried skim milk or whey. Attention is called to the possibility of destruction of riboflavin in natural feeds and the use of less rich sources of the substance in order to cheapen the ration and to the higher requirements of larger birds for this vitamin.

Effect of level of dietary riboflavin upon quantity stored in eggs and rates of storage, L. C. NORRIS and J. C. BAUERNFEIND. (Cornell Univ.). (*Food Res.*, 5 (1940), No. 5, pp. 521-532, figs. 4).—By methods previously noted (E. S. R., 85, p. 151) studies were made of the riboflavin content of the yolks and whites of eggs of hens receiving from 100 to 2,000 μ g. of the vitamin per 100 gm. of ration. The riboflavin content of eggs of hens on low vitamin rations was less than 1.4 μ g. per gram. Increases up to about 1,000 μ g. of riboflavin per 100 gm. of ration produced progressive increases in the riboflavin content of the whole egg for periods of from 2 to 4 weeks. Regardless of the additional amount of

riboflavin supplied in the diet, the riboflavin contents of the egg white and yoke, respectively, were not increased above 2.89 and 3.98 μ g. per gram. The riboflavin content of the egg white changed more rapidly than that of the egg yoke. Similar results were obtained in assaying by the chemical, bacteriological (Snell and Strong) (E. S. R., 82, p. 587), and chick (E. S. R., 74, p. 682) methods.

Effect of thyroidectomy on production, quality, and composition of chicken eggs, L. W. TAYLOR and B. R. BURMESTER. (Univ. Calif.). (*Poultry Sci.*, 19 (1940), No. 5, pp. 326-331, figs. 2).—Using six pairs of White Leghorn pullets, carefully matched with reference to egg-producing ability, one of each pair was completely thyroidectomized. Average egg production during the subsequent year was only 27.1 percent as great in the thyroidectomized birds as in the controls. The rate of increase in egg weight was significantly greater in the controls, while rate of decrease in percentage shell during the same period was significantly greater in the treated birds. Other changes due to thyroidectomy were decreases in percentage of total white, percentage of firm white, and percentage of solids in the white, and increases in the percentage of outer liquid white and percentage of yolk.

With crossbred pullets, 4 birds incompletely thyroidectomized and 5 completely thyroidectomized produced on the average 66.7 and 35.8 percent, respectively, as much as the average of 10 normal controls. Either the complete or partial removal of the thyroid gland resulted in the accumulation of large amounts of fat, which in 2 cases was associated with degeneration of the liver.

The rate of plumping of uterine eggs immersed in an artificial uterine solution, B. R. BURMESTER, H. M. SCOTT, and L. E. CARD. (Univ. Ill.). (*Poultry Sci.*, 19 (1940), No. 5, pp. 299-302, figs. 2).—Eggs removed from the hen after they had been in the uterus for periods of time ranging from 0 to 12 hr. were weighed before and after immersion for 20 min. in artificial uterine solution (E. S. R., 80, p. 671). The rate of increase in weight due to uptake of the solution was maximal just after the eggs entered the uterus, the increase in weight of eggs removed at this stage amounting to about 4 percent in 20 min. The rate then declined, amounting to about 1.2 percent in 20 min. for eggs retained in the uterus 6 hr., and reached a minimum level after eggs had been in the uterus for 8 hr. It appeared that the amount of calcium carbonate in the shell was not the sole factor governing the rate of uptake of uterine fluid.

The relation of specific gravity to hatching power in eggs of the domestic fowl, S. S. MUNRO (*Sci. Agr.*, 21 (1940), No. 2, pp. 53-62, figs. 2).—Statistical analysis was made of the specific gravity of 2,957 Barred Plymouth Rock and 2,687 White Leghorn eggs with reference to the fertility and hatchability of the eggs after incubation. Contrary to the findings of Mussehl and Halbersleben (E. S. R., 49, p. 373), Plymouth Rock eggs below a specific gravity of 1.078 and Leghorns below 1.086 decreased rapidly in hatching power. The eggs below these points in specific gravity averaged 7.8 percent lower in fertility, 82.4 in fertile eggs hatching, and 29.7 percent lower in total eggs hatching. By discarding the low-specific gravity eggs it was possible to improve hatchability of the eggs set by 8.3 percent. The eggs laid by each hen showed a characteristic specific gravity, and when paired for those showing high and low values in this manner and χ^2 values determined, the odds were greater than 99:1 for separation of fertile and hatchable eggs on this basis. Chicks from hens laying eggs with low specific gravity had a higher death rate during brooding than chicks from hens laying eggs with a high specific gravity.

Checking market grades with meat measurements, H. M. SCOTT. (Kans. State Col.). (*U. S. Egg and Poultry Mag.*, 46 (1940), No. 12, pp. 717-719, figs. 2).—The factors influencing fleshing in poultry, as judged by the eye, are

grouped under three main headings, (1) development of musculature, (2) amount and distribution of fat, and (3) shape of body.

The composition of turkeys as affected by age and sex, H. M. MARSHAW and R. R. RECTOR. (U. S. D. A.). (*Poultry Sci.*, 19 (1940), No. 6, pp. 404-411).—Chemical and physical analyses of ♂ and ♀ crossbred turkeys at 16, 20, 24, 28, and 32 weeks of age showed that the percentage of dressed and drawn weights and total edible portions increased with age. The percentages of internal and external fat and skin made the greatest gains during the ages of from 28 to 32 weeks. The proportion of breast muscle and total edible portions of turkeys was higher than in chickens (E. S. R., 79, p. 525). Turkeys were similar to chickens in composition, but a considerably larger amount of fat was present in the 32-week-old turkeys than was found in the fattest roasting chickens. Unless especially fat birds are desired, turkeys should be marketed by 28 weeks of age.

Feeding grasshoppers to turkeys, T. T. MILBY and R. PENQUITT. (Okla. A. and M. Col.). (*Poultry Sci.*, 19 (1940), No. 5, pp. 332-336).—Grasshopper meal was prepared from the live insects, either by pressure cooking for 45 min. or quick freezing, followed in either case by drying and grinding. Substitution of the grasshopper meal in place of the ordinary protein concentrate in all-mash rations for growing poults did not significantly affect the rate of growth, although the feed required per unit of gain was somewhat higher on the grasshopper meal rations. Supplementing the normal ration with whole grasshoppers which had been quick-frozen and then thawed just prior to feeding (feed consumption 79 percent mash and 21 percent grasshoppers on dry basis) resulted in more rapid growth of poults than when the control ration was fed. No undesirable flavors or odors were imparted to the birds as a result of the grasshopper feeding.

Concentrate feeding of broad breasted Bronze turkeys, E. I. ROBERTSON and L. A. WILHELM. (Wash. Expt. Sta.). (*U. S. Egg and Poultry Mag.*, 46 (1940), No. 10, pp. 597-600, 639, 640).—In a study of the rate of growth and efficiency of feed utilization by toms and hen turkeys, poults 8 weeks of age on alfalfa range were fed free choice with a high-protein concentrate and corn, wheat, oats, and barley. Other groups received a developing mash with mixtures of whole grains in hoppers. The third and fourth groups received an all-mash ration, one on the range and the other in confinement on a sun porch without green feed. Part of the turkeys received limestone with granite grit only. At 28 weeks of age, the toms receiving the protein concentrate with the grains on range averaged 28.1 lb. in live weight, as compared with 26.0 for those on mash and grain, 25.2 for those on the all-mash ration, and 22.7 lb. for the toms in confinement. The toms on concentrate and whole-grain rations consumed 3.84 lb. of feed per pound of gain, as compared with 4.61, 4.83, and 5.05 lb. of feed per pound of gain for those fed on mash and range, mash and grain, and all mash in confinement, respectively. The hens showed smaller differences between the lots, but there was more efficient utilization of the concentrate and free choice of grains than was found for the other rations. On the whole, the hens also used feed as efficiently as the toms.

Where does the broad-breasted Bronze fit into the poultry picture? E. Y. SMITH. (Cornell Univ.). (*U. S. Egg and Poultry Mag.*, 46 (1940), No. 12, pp. 744-746, figs. 3).—A brief description of the broad-breasted Bronze turkey, which is said to be superior to other breeds for shape and quality of the carcass.

Interrelation of temperature, humidity, and air movement in the incubation of pheasant and quail eggs, A. L. ROMANOFF. (N. Y. [Cornell] Expt. Sta.). (*Game Breeder & Sportsman*, 43 (1939), No. 5, pp. 66-68, 71, 76, 77).—In studies pertaining to the interrelation of these conditions on the incubation

of pheasant and quail eggs and the development of the young after hatching, the author found that when uniform conditions were provided through 20 days of incubation, low temperature and low humidity had more pronounced deleterious effects than did high temperature and high humidity, both on hatchability and the occurrence of cripples. Slow air movement was less harmful, and was often beneficial, as contrasted with rapid air movement. Some differences in the optimum combinations of these factors in the incubators for the hatchability of pheasant and quail eggs were noted. For example, pheasant eggs hatched best with a low temperature, high humidity, and slow air movement, whereas quail eggs hatched best with low temperature, medium humidity, and slow air movement. The brooding mortality was invariably higher among chicks hatched under the extremely high or low conditions. The specific type of incubator was important as regards the best hatching temperature and humidity on account of the differences in the rate of air circulation.

DAIRY FARMING—DAIRYING

[Experiments with dairy cattle and dairy products in Pennsylvania] (*Pennsylvania Sta. Bul. 399 (1940), pp. 5-11, 12-14, figs. 2*).—Investigations for which results are noted include the economy of full-feeding dairy cows, by A. A. Borland (coop. U. S. D. A.); the value of green hay as a source of vitamin A for calves, and the relative values of molasses-alfalfa and molasses-soybean silages, both by S. I. Bechdel; the type of fermentation occurring in alfalfa silage preserved with molasses or phosphoric acid, by R. W. Stone; and factors affecting milk production costs, by W. L. Barr.

From studies with dairy products results are reported on the value of pasteurization in improving the keeping quality of frozen cream, and factors responsible for cooked flavor in milk and cream, both by C. D. Dahle; the stability of vitamin C to heat, by D. V. Josephson; the effect of homogenization on various dairy products, and the reliability of the phosphatase test, both by F. J. Doan; the influence of starters on cheese flavor, by Dahle and T. G. Anderson; the value of antioxidants for treating paper milk containers, by Dahle and Josephson; the control of lactic acid production in milk, by Stone; and the bacterial content of various levels of milk stored in cans, and the use of the photoelectric colorimeter in determining the bacterial population of milk, both by Anderson.

[Progress in dairy chemistry], S. J. ROWLAND and G. W. SCOTT BLAIR (*Jour. Dairy Res. [London], 11 (1940), No. 1, pp. 84-111*).—This review deals with the progress in dairy chemistry from the middle of 1937 to the middle of 1939. The bibliography contains 233 references (*E. S. R.*, 79, p. 384).

A study of persistency in a herd of Ayrshire cows, G. PONTECORVO (*Jour. Dairy Res. [London], 11 (1940), No. 2, pp. 113-120, fig. 1*).—In this analysis of the production records of an inbred Ayrshire herd, only normal lactations falling between the second and seventh were used, with particular attention directed to that portion of the lactation curve between the peak of production and the rapid decline near the end of the period. Month of calving accounted for about one-third of the variation in persistency in this herd, while of the remaining variance approximately one-half is attributed to differences among cows. When a correction for month of calving was applied, persistency was found to be quite constant for different lactations of the same cow. The relationship between maximum yield and persistency is discussed.

The protein requirements for milk production, S. BARTLETT, A. S. FOOT, S. L. HUTHNANCE, and J. MACKINTOSH (*Jour. Dairy Res. [London], 11 (1940)*),

No. 2, pp. 121-135, fig. 1).—In three large-scale experiments, involving about 1,400 cows in all, one-half of the animals in each herd received approximately a 16-percent concentrate ration, while the remaining cows were fed a ration containing approximately 21 percent protein. In addition to roughage all cows received 3.5 lb. of concentrate daily per gallon of milk produced. No significant difference in the milk production, live weight gains, or general condition of the animals was noted which could be ascribed to differences in the level of protein feeding. It appeared that the generally accepted feeding standard provided for an unduly high level of protein feeding.

The effect of concentrate feed on the milk production of native carabaos, T. V. REON (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 2, pp. 195-200).—Three feeding trials comparing soiling crops alone v. soiling crops and concentrates with animals having access to pasture in each case gave evidence that milk production was increased an average of 17.68 percent by the feeding of concentrates. At prevailing prices, concentrate feeding was an economical practice.

The dairying possibilities of native carabaos, L. J. PALIOTE and P. S. MANALO (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 4, pp. 379-389).—A preliminary report of the performance of foundation animals being used in a systematic breeding experiment to improve the dairy qualities of carabao in the Philippines.

The partition of serum calcium about the time of parturition in the dairy cow, J. DUCKWORTH and W. GODDEN (*Jour. Dairy Res. [London]*, 11 (1940), No. 1, pp. 9-14).—Data are presented on the serum calcium, partition of 10 individuals immediately preceeding and following parturition. Included are values for total calcium, the calcium ion, ultrafiltrable calcium complex, non-ultrafiltrable calcium complex, and protein-bound calcium, also inorganic phosphorous and serum phosphatase. The significance of the variations in concentration of the bound calcium fractions is discussed.

A long-term study of the partition of serum calcium in Ayrshire cows, W. GODDEN and J. DUCKWORTH (*Jour. Dairy Res. [London]*, 11 (1940), No. 1, pp. 15-21, fig. 1).—Based on analyses of a series of blood samples collected from 14 individuals, the following average fractionation of serum calcium in the dairy cow was determined: Calcium ion, 10-12 percent; ultrafiltrable calcium complex, 40-45; nonultrafiltrable calcium complex, about 20; protein-bound calcium, about 25; and ultrafiltrable calcium 50-53 percent.

The nutritional value of milk and milk products, S. K. KON (*Jour. Dairy Res. [London]*, 11 (1940), No. 2, pp. 196-224).—A biennial review covering progress in this field during 1938 and 1939. The bibliography contains 411 references.

The problem of variations in the growth-promoting value of milk for rats, S. BARTLETT, K. M. HENRY, and S. K. KON (*Jour. Dairy Res. [London]*, 11 (1940), No. 1, pp. 22-36, figs. 4).—Three cows having access to good pasture and three similar cows continuously stall-fed on dry feed supplied the milk used in these experiments. Both raw and pasteurized mineralized milk from each group was fed to young rats. No significant difference either in appetite or gain in weight occurred under the different feeding regimes. In similar tests in which sugar was added to the milks to double their caloric value the appetite and growth of rats were the same on the raw summer (pasture) and winter (dry feed) milks. However, the summer milk, whether raw or pasturized, was superior to the pasteurized winter milk. Guinea pigs fed raw mineralized milk with or without sugar died in a short time, but there was no difference in growth rate or time of survival between the summer and winter milk groups.

The vitamin A and carotene content of Shorthorn colostrum, K. M. HENRY, J. HOUSTON, and S. K. KON (*Jour. Dairy Res. [London]*, 11 (1940), No. 1, pp. 1-8).—Determinations were made on samples of colostrum from 13 cows. The concentration of vitamin A in the first colostrum ranged from 8,160 to 820 Moore blue units per 100 gm. and that of carotene from 2,026 to 411 Moore yellow units per 100 gm. The daily yield of vitamin A was higher in the colostrum than in later milk. Access to pasture prior to calving had no apparent effect on the secretion of vitamin A in colostrum but increased the output of carotene.

The vitamin B₁ and riboflavin of milk, I-IV (*Jour. Dairy Res. [London]*, 11 (1940), No. 2, pp. 145-183, figs. 5).—Four reports are noted.

I. *The application of Jansen's thiochrome test to the estimation of vitamin B₁ in milk*, J. Houston, S. K. Kon, and S. Y. Thompson (pp. 146-150).—A method for the estimation of vitamin B₁ in milk by a modified Jansen test, involving takaphosphatase treatment, is fully described.

II. *The different forms of vitamin B₁ in milk*, J. Houston, S. K. Kon, and S. Y. Thompson (pp. 151-155).—Based on the results of a number of experiments, it is shown that vitamin B₁ is present in milk both unesterified and phosphorylated. Both forms may be freely diffusible or combined with protein either loosely or by firmer bonds.

III. *Effect of stage of lactation and of season on the vitamin B₁ and riboflavin content of milk*, J. Houston, S. K. Kon, and S. Y. Thompson (pp. 155-167).—The total vitamin B₁ content of colostrum ranged from 60 to 100 µg. per 100 cc., that of early milk up to 60 µg., and that of milk in mid- or late lactation from 30 to 40 µg. per 100 cc. Feeding and season had little or no effect on the vitamin B₁ content of milk. Other findings indicated that vitamin B₁ of milk is mostly derived from the secretory cells of the mammary gland and not directly from the blood. The riboflavin content of colostrum was three to four times higher than that of later milk. Mean values for normal milk were about 110 and 150 µg. per 100 cc. in winter and summer, respectively.

IV. *Comparison of chemical and biological methods of estimation of vitamin B₁*, K. M. Henry, J. Houston, S. K. Kon, and P. White (pp. 167-181).—By use of a fluorimetric test which measured the total vitamin B₁ in milk, values were obtained which were in satisfactory agreement with biological assays in all cases except when evaporated milk was fed. Since the apparent potency of all milks as measured biologically was higher when milk was fed at a high level than at a low level, and since evaporated milk had to be fed in relatively large quantities, the discrepancy between fluorimetric and biological assay values may be explained on this basis.

The effect of commercial pasteurization and sterilization on the vitamin B₁ and riboflavin content of milk as measured by chemical methods, J. Houston, S. K. Kon, and S. Y. Thompson (*Jour. Dairy Res. [London]*, 11 (1940), No. 1, pp. 67-70).—The riboflavin content of milk was unaffected either by commercial pasteurization or commercial sterilization of the milk. The former process destroyed up to 10 percent and the latter up to 50 percent of the vitamin B₁ in the milk.

[Abstracts of papers on dairy bacteriology] (*Jour. Bact.*, 40 (1940), No. 1, pp. 157, 159, 160).—The following papers were presented at the joint meeting of the north central and Indiana branches of the Society of American Bacteriologists and the Society of Illinois Bacteriologists, held at Chicago, Ill., May 3-4, 1940: Non-Spore-Forming Thermotolerant Bacteria in Milk, by H. Wainess and E. H. Parfitt (Purdue Univ.); Heat-Resisting Bacteria in Milk, by M. J. Prucha and A. C. Maack (Univ. Ill.); Bacteriology of Brick Cheese, by

E. M. Foster, J. C. Garey, and W. C. Frazier (Univ. Wis.); and Some Milk Plant Control Problems of a Bacterial Nature, by P. H. Tracy (Univ. Ill.).

The value of certain tests in the differentiation of *Lactobacillus bulgaricus* from *Lactobacillus acidophilus*, J. M. SHERMAN and H. M. HODGE (Cornell Univ.). (*Jour. Bact.*, 40 (1940), No. 1, pp. 11-22).—To further determine the response of cultures of *L. bulgaricus* and *L. acidophilus* to various conditions, 152 cultures of the former and 43 cultures of the latter were included in the experiments described. *L. bulgaricus* was unable to make repeated growth in lactose-peptone-yeast extract broth, or to grow in media containing 2.5 percent sodium chloride, or in alkaline broth (pH 7.8). *L. acidophilus* was not inhibited by the mildly alkaline or saline media and grew well through 10 successive transfers in the simple media. *L. bulgaricus* rarely grew at 15° C., whereas *L. acidophilus* usually grew at this temperature. *L. acidophilus* never grew at 50°, while freshly isolated strains of *L. bulgaricus* nearly always grew at this temperature although old laboratory cultures frequently failed. These tests were found to correlate with other differential methods.

The influence of various factors on the fermentation end-products of the heterofermentative streptococci, C. C. THIEL (*Jour. Dairy Res. [London]*, 11 (1940), No. 1, pp. 51-61, fig. 1).—In this study of the influence of temperature, pH, oxygen tension, and yeast autolysate, on the activity of heterofermentative lactic acid streptococci, anaerobic conditions and relatively low temperature increased total lactic acid production, while anaerobic conditions and the presence of chalk increased the ratio of lactic acid formed to sugar utilized. Acetic acid production was higher in the presence of chalk and yeast at low temperatures but was decreased by anaerobic conditions. The ratio of acetic acid, both to sugar used and to lactic acid formed, was smaller at lower temperatures in the presence of yeast and chalk and under anaerobic conditions. Total alcohol production and also the ratio of alcohol formed to sugar used was higher when chalk or yeast was added under anaerobic conditions at low temperatures.

The influence of various factors on the fermentation end-products of the heterofermentative lactobacilli, C. C. THIEL (*Jour. Dairy Res. [London]*, 11 (1940), No. 2, pp. 136-144).—Following the same experimental procedures as in the above experiment, it was found that with the lactobacilli the total production of lactic acid was increased by the presence of chalk and yeast but was little affected by temperature or oxygen tension. The ratio of lactic acid produced to sugar used was decreased by the low temperatures and increased by the addition of chalk. The presence of chalk and yeast and anaerobic conditions tended to increase the total production of acetic acid but to decrease the ratio of acetic acid formed to sugar used and lactic acid formed. Total alcohol production and its ratio to sugar used was increased by anaerobiosis and by the presence of chalk. Yeast and temperature had little effect in this regard.

The action of chemical disinfectants on bacteriophages for the lactic streptococci, G. J. E. HUNTER and H. R. WHITEHEAD (*Jour. Dairy Res. [London]*, 11 (1940), No. 1, pp. 62-66).—Of several disinfectants tested, active chlorine and permanganate were by far the most effective in inactivating bacteriophage for the lactic streptococci, suggesting that such inactivation is brought about by oxidation.

The bacterial content of goat milk, C. S. BRYAN. (Mich. Expt. Sta.). (*Vet. Med.*, 35 (1940), No. 10, p. 533; *Jour. Amer. Vet. Med. Assoc.*, 37 (1940), No. 764, pp. 551, 552).—Of 380 goats examined, 95.9 percent had neither in-

sections nor noninfections mastitis, the remainder showing various degrees of udder infection. Milk from the noninfected animals was generally of high quality, but that of milk produced with mastitis was greatly reduced. The influence of various types of infection on milk characteristics is briefly discussed.

An agar slice method for the detection of mold and yeast on utensils. J. D. WILDMAN. (U. S. D. A.). (*Jour. Milk Technol.*, 3 (1940), No. 3, pp. 162, 163).—This contribution briefly describes the operation and practical application of the method.

The elimination of mastitis. G. J. HUCKER. (N. Y. State Expt. Sta.). (*Jour. Milk Technol.*, 3 (1940), No. 3, pp. 159-161).—Preliminary results reported gave evidence that definite progress is being made in the reduction of mastitis through the segregation and elimination program as now practiced in well-organized control areas.

Preliminary report on the deaeration of market milk. P. F. SHARP, D. B. HAND, and E. S. GUTHRIE. (Cornell Univ.). (*Jour. Milk Technol.*, 3 (1940), No. 3, pp. 137-143, fig. 1).—A continuous deaerating unit of 3,000 lb. per hour capacity is described. With this equipment deaeration may be carried out either before or after pasteurization. Data are presented on the oxygen content and also the resistance to oxidized flavor development during storage of milk samples collected at various stages in the processing of milk, both by the conventional holder-pasteurization method and when deaeration was employed. Typical values for bottled milk following conventional holder pasteurization, deaeration plus holder pasteurization, and deaeration plus flash pasteurization were 5.45, 1.86, and 0.8 mg. of oxygen per liter, respectively. Deaeration greatly increased the resistance of milk to the development of oxidized flavor and rendered the ascorbic acid stable. Airtight connections in a few critical places in the milk line and changes in bottler design, which prevent reaeration, were essential to best results.

Additional information is contained in the discussion of this paper.

A study of concentration and freezing as a means of preserving fluid whole milk. R. T. CORLEY and F. J. DOAN. (Pa. Expt. Sta.). (*Food Res.*, 5 (1940), No. 4, pp. 369-378, fig. 1).—Batches of fresh fluid milk were pasteurized at 145° F. for 30 min. and at 180° for 15 min. Subbatches of each were then (1) condensed 3 to 1, frozen, and stored at 0° F., (2) condensed 3 to 1, homogenized at 2,500 lb., frozen, and stored, or (3) homogenized at 2,500 lb., condensed 3 to 1, frozen, and stored. The higher pasteurization temperature was preferable, since it retarded the development of tallowy flavor and lessened the tendency for the formation of irreversibly coagulated protein during storage, but the lower temperature was more effective in retarding the rate of thickening. Homogenization retarded the development of tallowy flavor, lessened the rate of thickening, postponed the appearance of irreversible coagulation, and aided in maintaining the fat in an emulsified condition. Homogenization following condensation was more effective than when it preceded condensation. Copper contamination resulted in tallowy flavor regardless of treatment when the storage period exceeded 5 weeks. The protein stability toward alcohol was not affected in those milks in which coagulated protein was capable of being redispersed by heating the thawed product. In the high-temperature milks homogenized after condensation irreversible coagulation occurred only after 15 weeks of frozen storage. Reconstituted milk prepared from the concentrated product after frozen storage exhibited in vitro digestion characteristics superior to boiled milk and similar to evaporated or acidified milk.

Haemolytic organism isolated from pasteurized cream. L. O'DROMA (*Jour. Dairy Res.* [London], 11 (1940), No. 1, pp. 37-42).—A weekly hemolytic organism

isolated from partially churned pasteurized cream is described. It appeared to be a resistant strain of *Streptococcus thermophilus* which had adapted itself as a churn contaminant.

"Vacreating" cream for buttermaking, G. H. WILSTER. (Oreg. State Col.). (*Canad. Dairy and Ice Cream Jour.*, 19 (1940), No. 5, pp. 44, 50).—A summary of research noted previously (E. S. R., 84, p. 387).

Studies on the preparation of hard cheese.—I, American Cheddar cheese, M. R. PASCUA (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 4, pp. 335-342).—Manufacturing procedures are described by which the finished product compared favorably with imported cheese, both in flavor and aroma. Control of temperature and humidity during curing proved absolutely necessary under Philippine conditions. It is concluded that with existing prices for fluid milk the manufacture of hard cheese in the Philippines is not profitable.

Studies on the manufacture of Cheddar cheese, A. VALENZUELA (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 2, pp. 187-194).—Employing manufacturing and curing methods, as described, 1-year-old Cheddar cheese of local origin compared favorably with imported Dutch cheese in physical and chemical composition. It is suggested that hard cheese manufacture may offer an outlet for excess fresh milk produced locally if facilities for its manufacture are available.

An objective measure of the consistency of cheese curd at the pitching point, G. W. SCOTT BLAIR and F. M. V. COPPEN (*Jour. Dairy Res. [London]*, 11 (1940), No. 2, pp. 187-195, figs. 6).—A simple method and the necessary apparatus is described for measuring the consistency of cheese curd during the cooking process. A simple weight-height (W/h) ratio is determined which was found to be highly correlated with moisture content. The test has been satisfactorily applied to Cheddar and several other varieties of cheese. It is believed that W/h will serve as an effective single-value criterion of consistency, suitable for judging pitching time if the acidity is also known.

Bacteriology of cheese.—V, Defects of blue (Roquefort-type) cheese, H. W. BRYANT and B. W. HAMMER (*Iowa Sta. Res. Bul. 283* (1940), pp. 109-147, figs. 10).—Continuing the reports of this series (E. S. R., 82, p. 815), this study includes a description of the methods used in the manufacture of blue cheese and Cheddar cheese and presents results of investigations on five defects encountered in blue cheese. A black discoloration, accompanied by a musty flavor, encountered in certain commercial cheeses was attributed to an organism identified as *Hormodendrum olivaceum*. Infection occurred through surface cracks and punch holes. Studies on gas formation in blue cheese through inoculation of the cheese milk with a culture of *Aerobacter aerogenes* isolated from gassy Cheddar cheese gave evidence that this problem is of relatively little importance in blue cheese manufacture. A defect characterized by a softening of the edges of blue cheese proved to be due to excessive moisture in the softened portions. Humidity control in the curing room seemed essential in preventing this condition. Another defect characterized by lack of mold growth in cheese inoculated in the usual manner proved to be due to the use of a mold powder in which an atypical strain of *Penicillium roqueforti* predominated. The necessity of using a mold powder of established effectiveness is emphasized. The fifth phase concerned a defect in which a gray discoloration and a mousy, ammoniacal flavor that later became soapy developed in blue cheese, accompanied by an increase in pH. The contaminating organism capable of reproducing the defect was not isolated. Excessive development of *P. roqueforti* or growth of a contaminating organism which might bring about certain lower disintegration products of protein are suggested as probable causes.

Minimum pasteurization requirements for ice cream, T. V. ARMSTRONG. (Ohio State Univ.). (*Canad. Dairy and Ice Cream Jour.*, 19 (1940), No. 11, pp. 38, 40).—A brief review, with 18 references.

The status of ice cream stabilizers, W. C. COLE. (Univ. Calif.). (*Internat. Assoc. Ice Cream Mfrs. Ann. Conv., San Francisco, Rpt. Proc.*, 59 (1939), vol. 2, pp. 35-44).—A summary, with 27 references.

A method for the accurate sampling of ice cream, A. C. MAAOK and P. H. TRACY. (Univ. Ill.). (*Jour. Milk Technol.*, 3 (1940), No. 3, pp. 123-125).—A report previously noted (E. S. R., 83, p. 241).

Suggested standards for chocolate milk drinks, W. [S.] MUELLER. (Mass. State Col.). (*Milk Plant Mo.*, 29 (1940), No. 3, pp. 25-28, figs. 3).—A discussion of factors to be considered in evaluating chocolate milk, based on research previously noted (E. S. R., 82, p. 245).

VETERINARY MEDICINE

Medical mycology, C. W. EMMONS (*Bot. Rev.*, 6 (1940), No. 9, pp. 474-514).—This contribution includes a bibliography of 315 titles.

Index-catalogue of medical and veterinary zoology.—Part 4, Authors: D to Dzunkovski, A. HASSALL, M. A. DOSS, R. M. TAYLOR, G. B. CARSON, and D. BERO (*U. S. Dept. Agr.*, 1940, pp. [1]+963-1176).—A continuation of this index catalog (E. S. R., 82, p. 101).

Introduction to parasitology, with special reference to the parasites of man, A. C. CHANDLER (*New York: John Wiley & Sons; London: Chapman & Hall*, 1940, 6. ed., rewritten and enl., pp. XIII+698, figs. 309).—A rewritten and enlarged edition of this work (E. S. R., 76, p. 213).

The mechanism of acquired immunity in infections with parasitic worms, W. H. TALLAFERRO (*Physiol. Rev.*, 20 (1940), No. 4, pp. 469-492).—This contribution includes a list of references to the literature cited.

[Contributions on animal pathology and parasitology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 13 (1939), No. 1-2, pp. 9-197, 229-233, 245-317, 347-358, 369-398, figs. 27).—Contributions presented (E. S. R., 82, p. 817) include the following: Ovine Anaplasmosis—The Transmission of *Anaplasma ovis* and *Eperythrozoon ovis* to the Blesbuck (*Damaliscus albifrons*) (pp. 9-16), and The Immunity in Heartwater (pp. 245-283), both by W. O. Neitz; Studies of the Rickettsias of the Typhus-Rocky-Mountain-Spotted-Fever Group in South Africa—I, Isolation of Strains, by R. A. Alexander, J. H. Mason, and W. O. Neitz (pp. 19-23), II, Morphology and Cultivation (pp. 25-89), III, The Disease in the Experimental Animal—Cross-Immunity Tests (pp. 41-65), and IV, Discussion and Classification (pp. 67-76), all by R. A. Alexander and J. H. Mason; The Antigenic Structure of Salmonellas Obtained From Domestic Animals and Birds in South Africa, by M. W. Henning (pp. 79-189); A Tetrachlorethylene Emulsion as an Anthelmintic, by H. O. Münnig and R. J. Ortlepp (pp. 193-197); Chemical Investigations Upon *Lotononis laza* E. and Z. I.—The Isolation of Pintol, a Fatty Ester and Benzaldehyde, by H. L. de Waal (pp. 229-233); A Rickettsiosis [of Sheep] New to South Africa, by K. Schulz (pp. 287-289); Serological Variants of *Salmonella typhimurium* Isolated From South African Animals, by M. W. Henning and D. Haig (pp. 293-306); The Use of Anthrax Vaccines Prepared From Avirulent (Uncapsulated) Variants of *Bacillus anthracis* (pp. 307-312), and The Immunization of Laboratory Animals Against Anthrax (pp. 313-317), both by M. Sterne; Alkali Poisoning, by D. G. Steyn (pp. 347-358); Quantitative Studies Upon Porphyrin Excretion in Bovine Congenital Porphyrinuria (Pink Tooth) No. 2, by P. J. J. Fourie and

G. C. S. Roets (pp. 360-382); and Bovine Congenital Porphyria (Pink Tooth) Inherited as a Recessive Character, by P. J. J. Fourie (pp. 383-398).

History of animal plagues of North America, B. [W.] BIERER (*Baltimore, 1939*, pp. [141]).—This further contribution by the author (E. S. R., 84, p. 100), presented in chronological form, includes 267 titles and an index.

The effect of glutathione on selenium toxicity, K. P. DuBois, M. RHIAN, and A. L. Moxon. (S. Dak. State Col.). (*S. Dak. Acad. Sci. Proc.*, 19 (1939), pp. 71-74).

A comparative study of liver glycogen values of control selenium and selenium-arsenic rats, R. L. POTTER, K. P. DuBois, and A. L. Moxon. (S. Dak. State Col.). (*S. Dak. Acad. Sci. Proc.*, 19 (1939), pp. 99-106).

Nature of Eimeria nieschulzi-growth-promoting potency of feeding stuffs.—I, **Positive effect of gray shorts**, E. R. BECKER (*Iowa State Col. Jour. Sci.*, 14 (1940), No. 3, pp. 317-321).—The disparity between the number of oocysts of *E. nieschulzi* eliminated by rats on a basal ration supplemented with soybean meal and on a basal ration supplemented with wheat shorts of comparable protein content may be attributed to the positive coccidium-growth-promoting potency of the middlings rather than to positive suppressive action of the soybean meal. Ether, alcohol, and petroleum ether extracts of gray shorts did not promote the development of the protozoan. Autoclaved mixtures of shorts and water yielded an extract that exhibited coccidium-growth-promoting potency. The substance (or substances) favoring the development of the parasite when added to the particular reference ration (R₂) used is water soluble and heat stable.

The bacteriostatic and the bactericidal action of certain organic sulphur compounds, E. L. EVERITT and M. X. SULLIVAN (*Jour. Wash. Acad. Sci.*, 30 (1940), No. 11, pp. 457-463).—Among the 50 compounds tested against streptococci, the most promising were phenothioxine and mercaptobenzothiazole.

Individual isolation of infected animals in a single room, F. L. HORSFALL, JR., and J. H. BAUER (*Jour. Bact.*, 40 (1940), No. 4, pp. 569-580, figs. 5).—Description is given of equipment for the individual isolation of infected animals in a single room that has been designed and constructed by the authors. Animals ranging in size from the mouse to the dog and monkey have been successfully isolated in the unit.

Ammonium bicarbonate secreted by surgical maggots stimulates healing in purulent wounds, W. ROBINSON. (U. S. D. A.). (*Amer. Jour. Surg.*, n. ser., 47 (1940), No. 1, pp. 111-115).—In continuing the work on secretions of surgical maggots (E. S. R., 76, p. 690; 77, p. 68; 81, p. 573), ammonium bicarbonate has been shown to be present in comparatively large quantities. With the aid of a number of physicians and surgeons this product has been tested clinically and found to possess marked healing properties similar to the two maggot products allantoin and urea. Ammonium bicarbonate is inexpensive and is easily prepared for use in solution form. It was applied to purulent wounds as a 1- or 2-percent sterile solution on gauze packs. The occurrence of this compound in maggot secretions is associated with the presence of the enzyme urease in maggot tissues. The blowfly *Phormia regina* was used in the investigation.

The soil as a source of microorganisms antagonistic to disease-producing bacteria, S. A. WAKSMAN and H. B. WOODRUFF. (N. J. Expt. Stas.). (*Jour. Bact.*, 40 (1940), No. 4, pp. 581-600, figs. 5).—Report is made of certain preliminary results of a study of the nature and abundance of some soil microorganisms, with special reference to their action against various bacteria, comprising both Gram-positive and Gram-negative forms. "Of a number of antag-

onistic organisms isolated from the soil, two were studied in greater detail, one a bacterium belonging to the *Pseudomonas aeruginosa* group and the other an *Actinomyces*. These organisms were found to inhibit the growth of several Gram-negative bacteria, as well and, even to a greater extent, of numerous Gram-positive bacteria. The active substance produced by the two antagonists was found to be largely thermostable. It passed through a Seitz filter, it was removed by charcoal, and was, partly at least, ether-soluble. Highly active preparations were obtained which inhibited, in very dilute solutions, the growth of *Escherichia coli*, *Brucella abortus*, and of many other bacteria. The active substance had also a strong bactericidal effect upon *E. coli* and *B. abortus*; 1 ml. of the preparations containing 0.4 mg. of the crude active substance killed aqueous suspensions of *E. coli* (215,000,000 viable cells) and of *B. abortus* (68,000,000 viable cells)." This substance of the two antagonists was found to reduce, in very low concentrations, the bacterial population of natural substrates, such as milk. When added to agar it prevented the development of the great majority of soil bacteria and actinomycetes but not of fungi.

A list is given of 19 references to the literature.

Anaplasmosis transmitted by tipping the horns of cattle, L. H. MOE, G. W. STILES, and D. E. HOWELL (Okla. Expt. Sta. and U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 764, pp. 450, 451).—Sixteen in a herd of 747 3-year-old grade Brahman steers, the horns of which were tipped before shipment from Lake Charles, La., to Osage County, Okla., developed anaplasmosis, the first appearing 42 days after the last date of tipping. Three of the animals succumbed to the affection.

Tick-borne human encephalitis in the European part of USSR and Siberia, M. P. CHUMAKOV and N. A. SEITLENOK (*Science*, 92 (1940), No. 2386, pp. 263, 264).

Johnes's disease infection of laboratory animals, L. SAHAI (*Vet. Jour.*, 96 (1940), No. 10, pp. 407-414, pls. 2).

Psittacosis: Possible response to sulfapyridine, H. C. HINSHAW (*Mayo Found. Med. Ed. and Res., Proc. Staff Mtgs. Mayo Clinic*, 15 (1940), No. 42, pp. 657-662, figs. 4).

The squirrel as a new host to a ringworm fungus, E. D. DELAMATER (*Mycologia*, 31 (1939), No. 5, pp. 519-526, figs. 3).—A study of a serious skin infection of a gray squirrel living at Homewood, Baltimore, Md., has for the first time revealed this squirrel to be a host to the ringworm fungus *Trichophyton mentagrophytes* (*gypseum*) (Robin-Sabouraud).

A ringworm disease of muskrats transferable to man, V. K. CHARLES (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 30 (1940), No. 8, pp. 338-344).—Description is given of a fungus of the genus *Trichophyton*, identified as *T. mentagrophytes* (Robin), an infection with which was acquired by an investigator of the Iowa Experiment Station while working with muskrats (*Ondatra zibethica*) near Ruthven, Iowa. The identity of the organisms, one of which was isolated from man and the other from muskrats, was proved by comparative cultural studies. Reference is made to the above noted report of this fungus as affecting the common gray squirrel.

Highly virulent strains of Rocky Mountain spotted fever virus isolated from ticks (*Dermacentor variabilis*) in Georgia, G. D. BRIGHAM and J. WATT (*Pub. Health Rpts. [U. S.]*, 55 (1940), No. 46, pp. 2125, 2126).—Report is made of the isolation of two strains of Rocky Mountain spotted fever virus from the American dog tick in Georgia.

A method of preparation of antigen for surra complement-fixation test, R. A. ACEVEDO (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 3, pp. 219-224).—

Description is given of an improved method of preparing antigen of pure trypanosomes from rats for the complement-fixation test for surra. The method is considered to solve the difficulties in the preparation of the antigen in small laboratories which lack apparatus.

Relationship of sex factors to resistance against *Cysticercus crassicolis* in rats, D. H. CAMPBELL and L. R. MELOHER (*Jour. Infect. Diseases*, 66 (1940), No. 2, pp. 184-188).—The experiments reported give additional evidence of a correlation between sex factors and resistance to infection of rats with the larvae of *Taenia taeniaeformis* (*C. crassicolis*).

A method of culturing large numbers of *Haemonchus contortus* larvae from eggs in cattle feces, G. E. CAUTHEN. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 7 (1940), No. 2, pp. 82, 83).—Description is given of a method in which sphagnum moss was used to absorb water and assure better aeration.

Investigations on possible intermediate hosts, other than oribatid mites, for *Moniezia expansa*, W. H. KELL. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 7 (1940), No. 2, pp. 68-71).—Evidence is presented indicating that oribatid mites are the only organisms which serve as intermediate hosts of the sheep tapeworm *M. expansa*. Field observations suggest that certain invertebrates, including ants, centipedes, and earthworms, may carry the eggs of *Moniezia* into the soil and deposit them in locations favorable for their survival, thus making the eggs available to the intermediate hosts over a longer period than would otherwise be possible.

A note on resistance studies with the nematode, *Nippostrongylus muris* (Yokogawa, 1920) in laboratory piebald rats, L. M. YUROC (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 2, pp. 147-152).—Experiments on natural and acquired resistance of rats to *N. muris* have shown age to be a factor in natural resistance, but not necessarily an entity in itself. It was established that a sufficiently high degree of acquired immunity to the extent of preventing death of rats can be induced by a single subcutaneous injection of 50 living larvae per gram of body live weight. Twenty references to the literature cited are listed.

Studies on staphylococci of animal origin, W. B. BELL. (Cornell Univ.). (*Cornell Vet.*, 30 (1940), No. 4, pp. 514-525, figs. 9).—In the work reported 61 strains of staphylococci were isolated from disease processes in horses, cattle, sheep, goats, pigs, dogs, cats, and guinea pigs. Fifty-four strains were of the *Staphylococcus aureus* type, 7 of the *S. albus*. Only 1 of the *S. albus* strains proved to be hemolytic, the other 6 were inert. Of the *S. aureus* strains about half exhibited the hemolytic zones characteristic of the alpha toxin, and about one-third of these showed the beta toxin as well. No strains were found which formed the beta toxins alone. Thirty-seven of the strains were studied as to their ability to coagulate blood plasma and to ferment mannitol, and of these 8 showed on cow-blood plates the zones characteristic of both alpha and beta toxins, 2 showed the alpha toxin only, and 17 were inert. In the coagulase tests the plasma of human, horse, and rabbit blood gave identical results in all cases except two, in which the rabbit plasma was coagulated and the others were not. Bovine plasma, with two exceptions, was not coagulated when the others were. Coagulation of human and equine plasma correlated perfectly with the presence of the alpha toxin. In one case when coagulation only of the rabbit plasma occurred, no toxins were demonstrated on blood plates.

Mannitol fermentation did not correlate well with the coagulase tests and toxin formation. All coagulase-positive and toxin-forming strains fermented mannitol (with one exception), but as many more strains which were coagulase

and toxin-negative proved capable of fermenting it also. This agrees with the finding of Cowan (E. S. R., 79, p. 391), who reports greater correlation among strains of human than among those of animal origin.

Eight strains producing hemolytic zones on blood plates, and one which did not, were cultivated on a fluid medium and filtrates were prepared in order to determine whether or not they were hemolytic. The strains which were hemolytic on plates produced filtrates which were hemolytic; the inert strain produced a nonhemolytic filtrate.

Observations on the pathogenicity of avian staphylococci, W. N. PLASTRIDGE and E. JUNGHEER ([Conn.] Storrs Expt. Sta.). (*Jour. Bact.*, 40 (1940), No. 3, pp. 464, 465).—Report is made of the biochemic and pathogenic properties of avian staphylococci obtained from joint, skin, and navel-ill lesions of barnyard fowl. The ability of avian staphylococci to coagulate rabbit plasma is considered a reliable means of detecting definitely pathogenic cultures of the avian staphylococci.

A gas-forming and proteolytic variant of *Str[ep]tococcus agalactiae*, J. G. DAVIS and H. J. ROGERS (*Vet. Rec.*, 52 (1940), No. 38, p. 692).

Organisms described as avian *Toxoplasma*, F. WOLFSON (*Amer. Jour. Hyg.*, 32 (1940), No. 3, Sect. C, pp. 88-99, figs. 4).—A review of the literature dealing with avian *Toxoplasma*, presented in chronological order, is accompanied by 49 references to the literature.

Corynebacterium equi in bovine pyometra, J. F. CRAIG and G. O. DAVIES (*Vet. Jour.*, 96 (1940), No. 10, pp. 417-419).

Streptococci other than *Streptococcus agalactiae* found in the cow's udder, R. B. LITTLE (*Cornell Vet.*, 30 (1940), No. 4, pp. 482-494).—The cultural characteristics and clinical manifestations in the udder of streptococci other than *S. agalactiae*, cultured from the milk of cows in three of the four herds studied, are described. It was shown that these other kinds of streptococci possess cultural characteristics quite different from those distinctive for *S. agalactiae*. Possibly one kind of mastitis caused by *S. dysgalactiae* is not commonly encountered except in an occasional herd, for in two herds no infections occurred during a period of 4 to 9 yr., respectively. *S. uberis* and the atypical streptococci which ferment mannite and split aesculin may cause either transient, mild, or severe infections. Of the atypical strains, certain ones were definitely regarded as *S. faecalis*. It is suggested that further study may reveal that the natural habitat of streptococci which attack mannite and aesculin may be the cow or the environmental conditions under which she is maintained.

Bang's disease (infectious abortion of cattle), H. WELCH (*Montana Sta. Vir.* 158 (1940), pp. 11, figs. 3).—A revision of Circular 152 (E. S. R., 79, p. 538).

The effect of variations in technic on the rapid or plate agglutination test for Bang's disease, M. H. ROEPKE and W. D. MURDOCK. (Minn. Expt. Sta. and U. S. D. A.). (*Cornell Vet.*, 30 (1940), No. 4, pp. 449-464).—Report is made of studies undertaken to determine whether or not the variations in technic employed in the rapid agglutination test affect the average titer readings and, if so, to what extent. The details are given in nine tables. The results have led the authors to conclude that a more rigid standard technic for conducting the plate test would be effective in reducing the percentage of tests by different operators which differ by from one to two dilutions.

The significance of the "ceased" reactor to Bang's disease, B. A. BRACH, M. R. LEWIN, and L. C. FERGUSON. (Wis. Expt. Sta. and U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 1, pp. 75-80).—Report is made of an investigation of the importance in the Bang's disease control program of cattle that following infection have lost their agglutination titer to *Brucella abortus* and are known as ceased reactors. In the experimental work 21 ceased reactors in two herds,

14 in one and 7 in the other, were allowed to commingle with a total of 51 cows from Bang-negative herds through either one or two gestation periods for each of the normal cows. "With the exception of a transitory infection in one-quarter of the udder of 1 of the ceased reactors, *B. abortus* was not demonstrated in any of these cows by culture or guinea pig injection at the time of calving. Moreover, none of the 54 normal cows showed evidence of having been infected by any of the ceased reactors, as evidenced by the lack of agglutinins in their serums for *B. abortus*, except 1 individual whose serum showed a low titer (1 : 100) for the organism. This one reactor was in the same herd as the cow showing the transitory infection cited." The authors were unable to demonstrate the organism in this cow either at the time of calving or after slaughter. The results indicate that it is relatively safe to allow ceased reactors to Bang's disease to mingle with noninfected stock.

Sporadic bovine encephalomyelitis (Buss disease), S. H. McNUTT and E. F. WALLER. (Iowa State Col.). (*Cornell Vet.*, 30 (1940), No. 4, pp. 437-448, figs. 6).—Report is made of a disease, a preliminary account of which has been noted (E. S. R., 83, p. 396). This affection, a sporadic bovine encephalomyelitis, was recognized in cattle under 3 yr. of age in five herds in an area in the eastern part of Iowa extending 200 miles diagonally across the State. The incubation period ranges from 4 to 27 days, and the course of the disease is from about 1 to 3 weeks. Death results in from 40 to 70 percent of the cases. There are usually no untoward aftereffects, and recovered animals are not carriers.

Sulfapyridine in the treatment of calf diphtheria, J. FARQUHARSON. (Colo. State Col.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 764, pp. 431-435, 436).—Report is made of nine cases of clinical *Actinomyces necrophorus* infections in cattle (one 3 weeks old, seven from 6 to 18 mo. old, and one 2.5 yr. old) treated with sulfapyridine, eight having been calf diphtheria and one vaginitis. "The initial treatment by intravenous inoculation of 0.06 gm. per kilogram (2.2 lb.) of body weight resulted in a blood concentration of 6.7 to 8 mg. percent of sulfapyridine. For continued therapeutic effectiveness this was followed by the oral administration of 1 gr. per pound of body weight. Twenty-four hr. after treatment was initiated, a marked improvement was noted in all cases. After an average duration of treatment for 6 days, all animals were apparently normal. In only one case was there a relapse. In this instance the recommended administration of the drug was not followed. The meager data suggest the use of sulfapyridine in the treatment of calf diphtheria and perhaps in other infections due to or associated with *A. necrophorus*." At the time the report was prepared, 4 mo. following the last treatment of the animals, recovery was complete and there was every reason to believe that it would be permanent.

The helminth parasites and parasitic diseases of sheep in Canada.—II, Notes on the effect of winter upon the free-living stages of nematode parasites of sheep on the pastures in eastern Canada, W. E. SWALES (*Canad. Jour. Compar. Med. and Vet. Sci.*, 4 (1940), No. 6, pp. 155-161).—A continuation of the work previously noted (E. S. R., 83, p. 248).

Human infection with ecthyma contagiosum, a virus disorder of sheep, R. NOMLAND (*Arch. Dermatol. and Syphilol.*, 42 (1940), No. 5, pp. 878-883, figs. 2).—Report is made of two cases of local inoculation in men of ecthyma contagiosum, a virus disease of sheep characterized by vesicular and, later, crusted lesions of the mouth. This virus can attack human beings exposed to it, giving rise to a highly inflammatory, purulent, or crusted lesion at the points of inoculation.

Vibrionic abortion in Michigan sheep, J. F. RYFF. (Mich. State Col.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 764, pp. 452, 453).—*Vibrio fetus*

is recorded as the causative agent of abortion in three flocks of sheep in Michigan within the past year.

A note on phenothiazine therapy in sheep, J. H. WHITLOCK and R. Cox. (Kans. State Col.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 764, pp. 436, 437).—Report is made of the treatment of a few lambs heavily infected with strongyline nemas (chiefly stomach and nodule worms) in which a single dose (0.5 gm. per pound of body weight) of phenothiazine solution, consisting of phenothiazine 10 gm., powdered acacia 0.5 gm., and water to make 30 cc., reduced the E. P. G. (eggs per gram of feces) count to a harmless level in all cases. Under the same conditions a solution consisting of 1.7 percent copper sulfate and 1.7 percent nicotinic sulfate solution (40 percent) failed to reduce the count in one animal to a nonsignificant level.

Tests of phenothiazine, a highly efficient anthelmintic, on a means of administration and the indicated uses for the control of parasitic diseases of sheep, W. E. SWALES (*Canad. Jour. Compar. Med.*, 3 (1939), No. 7, pp. 188-194).—The preliminary series of 10 experiments reported has confirmed the finding of Harwood and his associates (E. S. R., 81, pp. 105, 715) that phenothiazine is of exceptional value for the control of nematode parasites of sheep. By administration of this chemical in the form of compressed tablets, developed by the author and which disintegrate rapidly in the stomach, its anthelmintic efficiency has been increased. It can be employed without prior fasting of the animals.

Further experiments on the use of phenothiazine as an anthelmintic for sheep, W. E. SWALES (*Canad. Jour. Res.*, 18 (1940), No. 7, Sect. D, pp. 266-271).—A further account (see above) is given of the development and production of a disintegrating tablet as a practical means of employing phenothiazine as an anthelmintic for sheep. Continued critical tests have shown high efficiencies against species of *Oesophagostomum*, *Haemonchus*, *Ostertagia*, *Monodontus*, *Nematodirus*, *Cooperia*, *Trichostrongylus*, and *Chabertia*. Tests against single infections with *Ostertagia* continued to show the complete efficiency of this form of treatment against this parasite. The periods of excretion of destroyed parasites with the feces are noted. It was found that single doses of phenothiazine did not anematize animals under treatment.

The fate of phenothiazine in the sheep, H. B. COLLIER (*Canad. Jour. Res.*, 18 (1940), No. 7, Sect. D, pp. 272-278).—Report is made of methods devised for the detection and estimation of phenothiazine and its derivatives in the feces, urine, blood, and milk of sheep following oral administration of the drug. Only unchanged phenothiazine was detected in the feces. In the urine was found a conjugate which was hydrolyzed by strong acid in the cold and tentatively identified as potassium leucophenothiazone sulfate. It was also present in the blood serum and the milk. Catalase is inhibited by leucophenothiazone, leucothionol, and thionol, but not by phenothiazone.

Studies on effects and excretion of phenothiazine when used as an anthelmintic for sheep, W. E. SWALES and H. B. COLLIER (*Canad. Jour. Res.*, 18 (1940), No. 7, Sect. D, pp. 279-287).—Tests were made on young sheep, barren ewes, pregnant ewes, and lactating ewes to determine the effects and excretion of phenothiazine and derivatives. Following the development of adequate technical methods, over 80 percent of the total dose was recovered from the feces and urine in roughly equal amounts. Observations were made upon the occurrence of the maximum concentrations of total leucophenothiazone in the blood, urine, and milk. No definite toxic effect was noted. Further evidence of anthelmintic efficiency of phenothiazine is presented. The bacteriostatic effect of the derivatives in the milk is noted.

The effect of food intake upon the dimensions of *Balanitidium* from swine in culture, N. D. LEVINE. (Univ. Ill.). (*Amer. Jour. Hyg.*, 32 (1940), No. 3, Sect. C, pp. 81-87).

The incidence of *Salmonella* in normal hogs, H. L. RUBIN. (Univ. Ky.). (*Jour. Bact.*, 40 (1940), No. 3, p. 463).—An examination of the mesenteric lymph glands of apparently normal hogs (from 40 lots consisting of 25 animals each) for *Salmonella* resulted in detection of such organisms in 19, or 47.5 percent, of the lots. An examination of 100 of 224 cultures of *Salmonella* resulted in the identification of *S. cholerae-suis kunsendorf*, *Salmonella* sp. (Derby type), *S. anatis*, *S. enteritidis*, *S. typhimurium*, *Salmonella* sp. (Bredeney type), (Muenchen type), (St. Paul type), (New Brunswick type), and a hitherto undescribed type which has been named "*S. lewington*". More than one type of *Salmonella* has been found present in several of the large lots and in one of the single lots thus far examined.

The prevalence of larvae of *Trichinella spiralis* in the hearts, livers, stomachs, and kidneys of experimentally infected swine, C. H. HILL. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 7 (1940), No. 2, pp. 83, 84).

The effect of human strains of *Hemophilus influenzae* on influenza virus infections of swine, J. R. MOTT and L. D. FOTHERGILL (*Jour. Bact.*, 40 (1940), No. 4, pp. 505-516, figs. 3).—An investigation of the possible existence of a concerted or synergistic action between known human strains of *H. influenzae* and two influenza virus strains in swine is reported upon. In no instance has a significant symbiotic action been demonstrated between the bacterial and the virus strains studied. The inability of human strains of *H. influenzae* to establish themselves in the respiratory tract of swine suggests a possible biologic difference between human and swine strains of *H. influenzae*. A list is given of 18 references to the literature.

The rôle of the veterinarian in effective immunization against hog cholera with tissue vaccine, W. H. BOXTON and G. M. and F. W. WOODS. (Univ. Calif. et al.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 764, pp. 427-430).

Corynebacterium equi as a possible cause of tuberculous-like lesions of swine, W. H. FELDMAN, H. E. MOSES, and A. G. KARLSON (*Cornell Vet.*, 30 (1940), No. 4, pp. 465-481, figs. 3).—The finding in Denmark that *C. equi* was responsible for tuberculouslike lesions of the lymph nodes of the region of the head and neck of swine led to an investigation of similar material from swine slaughtered in Minnesota. A submaxillary lymph node was obtained from the carcass of each of 89 swine, the opposite lymph node of which was considered in all instances to be tuberculous. A histological study of the lymph nodes and a study of cultures of emulsified tissue, together with guinea pig and rabbit inoculations, resulted in the finding of viable tubercle bacilli of the avian type to be present in 55 of the 89 specimens. In 13 instances *C. equi* was associated with tubercle bacilli, while in 7 instances *C. equi* alone was found. Neither viable tubercle bacilli nor *C. equi* was found in 34 of the specimens, although gross or microscopic lesions were noted in 28. In addition, *C. equi* was isolated from 6 of 25 apparently normal submaxillary lymph nodes of presumably non-tuberculous swine.

The findings have led to the conclusion that in Minnesota, in the great majority of instances, tubercle bacilli are the responsible etiologic agents in localized nodular or diffuse necrotizing granulomatous lesions of the submaxillary lymph nodes of swine, that *C. equi* occurs in approximately from 20 to 25 percent of diseased submaxillary lymph nodes of swine in association with tubercle bacilli, that the organism also occurs in approximately the same percentage of apparently normal submaxillary lymph nodes of nontuberculous swine, and

that there is no evidence to indicate *C. equi* is etiologically related to tuberculouslike adenitis of swine nor that a specific tissue reaction occurs by which invasion of the tissues with *C. equi* can be distinguished from that of tubercle bacilli. The part *C. equi* and other nonacidfast bacteria associated with tuberculous adenitis may contribute to the tissue reaction is obscure.

Properties of the isolated equine encephalomyelitis virus (eastern strain), D. G. SHARP, A. R. TAYLOR, D. BEARD, H. FINKELSTEIN, and J. W. BEARD (*Science*, 92 (1940), No. 2390, pp. 359-361).—Report is made of the investigation of a specific material obtained by ultracentrifugal fractionation of extracts of chick embryos diseased with virus of equine encephalomyelitis (eastern strain). The findings indicate that the material (with which is associated the infectivity of the extracts from which it is derived) is identical with the virus. A description by Taylor and associates of the process consistently yielding the purified virus has been noted (*E. S. R.*, 83, p. 399). The purified material studied is specific to the virus-diseased chick embryos. No trace of a similar or related component has been found in repeated studies of normal embryo tissue. The homogeneity of the product is clearly evident in the findings with the analytical ultracentrifuge and in the uniformity of its biological and chemical behavior. It would thus appear that the virus of equine encephalomyelitis (eastern strain) is a complex of high molecular weight consisting of phospholipids, cholesterol, fatty acid, and ribonucleoprotein.

pH stability of the virus of equine encephalomyelitis (eastern strain) under various conditions, H. FINKELSTEIN, W. MARX, and D. and J. W. BEARD (*Jour. Infect. Diseases*, 66 (1940), No. 2, pp. 117-126, figs. 6).—Report is made on the pH stability of equine encephalomyelitis virus (eastern strain), which was studied by means of infectivity titrations in mice.

Endoparasites of aged horses and mules at the Beltsville Research Center of the U. S. Department of Agriculture, A. O. FOSTER and R. T. HABERMANN. (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 7 (1940), No. 2, pp. 85-87).

A field trial with phenothiazine as an equine anthelmintic, C. E. HOWELL and J. W. BETTON. (Univ. Calif.). (*Cornell Vet.*, 30 (1940), No. 4, pp. 526-532).—Powdered phenothiazine fed mixed with the grain ration proved to be 100 percent effective in removing strongyles from 37 horses and from 78 to 95 percent effective in 8 horses. This treatment was 100 percent effective in removing *Trichostrongylus axei* from 4 colts but was ineffective against *Ascaris equorum* and *Gastrophilus* spp. Numerous *Oxyuris equi* were found in the feces of treated horses from 2 to 4 days following treatment. Dosage of the drug used was 45 gm. for weanlings and 2 yearlings and 70 or 80 gm. for the remaining horses. The efficiency of the drug was based on fecal examination before and after treatment and similar examinations of 28 control horses. No toxic effects were noted in any horses or foals following treatment.

A sporadic case of brucellosis in the dog, A. F. NOLAN. (Ky. Expt. Sta.). (*Cornell Vet.*, 30 (1940), No. 4, pp. 542-545).—Report is made of brucellosis in a dog which 3 mo. prior to the development of symptoms had ingested an unknown amount of meat from horses that had been inoculated with large doses of *Brucella abortus suis*.

Brucellosis in a dog, A. G. KARLSON and L. B. CLAUSEN. (Minn. Expt. Sta. and U. S. D. A.). (*Cornell Vet.*, 30 (1940), No. 4, pp. 546, 547).—Report is made of a case of brucellosis due to *Brucella abortus* in a dog which had been fed daily a quart of raw milk from a herd of 14 cows, 9 of which were suffering from Bang's disease.

Preliminary observations on the efficacy of diphenylamine for the removal of intestinal nematodes from dogs, J. E. GUTHRIE (U. S. D. A.). (*Helminthol. Soc. Wash. Proc.*, 7 (1940), No. 2, pp. 84, 85).—In these experiments diphenylamine in doses of from 3 to 10 gm. per dog removed 64.2 percent of 291 hookworms from 6 dogs, 61.9 percent of 21 ascarids from 3 dogs, and 88.6 percent of 537 whipworms from 5 dogs. At no time were any symptoms of intoxication observed which could be attributed to the treatment.

[Contributions on animal pathology and parasitology] (*Poultry Sci.*, 19 (1940), No. 5, pp. 345–366).—Contributions presented at the annual meeting of the Poultry Science Association held in June 1940, abstracts of which are given, include the following: Egg Propagation of Turkey Pox Virus, by F. R. Beaudette and C. B. Hudson (p. 345) (N. J. Expt. Stas.); The Effect of Intraperitoneal Injection of Lymphomatous Nerve Tissue Into Chickens From Strains Selected for Resistance and Susceptibility to Spontaneous Lymphomatosis, by K. B. DeOme, J. R. Beach, I. M. Lerner, and L. W. Taylor (pp. 347, 348) (Univ. Calif.); Flowers of Sulphur and Charcoal in the Control of Experimentally Produced Coccidiosis, by O. E. Goff and C. W. Upp (p. 349) (La. Sta.); The Pathologic Concept of So-Called "Pullet Disease," by E. Jungherr and J. M. Levine (p. 354) (Univ. Conn.); The Initiation of Avian Coccidial Infection with Merozoites, by P. P. Levine (p. 355); The Importance of Pathological Study in Poultry Disease, by E. L. Stubbs (pp. 362, 363); Studies on Gizzard Ulceration, by A. E. Tepper and H. R. Bird (p. 364) (Univ. Md.); The Outlook for Pullorum Disease Control and Eradication, by H. Van Roekel (p. 365) (Mass. Sta.); and Observations on Fowl Cholera Diagnosis, by J. F. Witter (p. 366) (Univ. Maine).

Viability in poultry flocks, D. R. MARBLE (Pa. Expt. Sta.). (*Amer. Egg and Poultry Rev.*, 1 (1940), No. 10, pp. 340, 342).—Adult mortality in the station poultry flocks for the 6-yr. period (1927–32) preceding the commencement of selection for viability was extremely high. This was due to various forms of fowl paralysis complex and included iritis, paralysis, and tumors. Data on the adult mortality for the 5 yr. (1933–37) following the change in the method of selection of breeding stock revealed a highly significant decrease in such losses, that in the Single-Comb White Leghorn and Barred Plymouth Rocks in 1937 having been approximately half that for the 6-yr. period. The laying-flock mortality during these 5 yr. of selection decreased from 39.8 percent in the Single-Comb White Leghorns for the 6-yr. average for 1927–32 to 20.1 percent in 1937. The decrease in the Barred Plymouth Rocks was from 48.7 percent for the 6-yr. average to 24.6 percent in 1937. Cases of paralysis, tumors, and leucosis still constitute a large proportion of the mortality, but the percentage of families showing high viability has increased from year to year. The data indicate that losses from fowl paralysis can be decreased gradually by the use of breeders from families that show resistance to the disease and by the use of hen in preference to pullet breeders.

A direct method of determining the erythrocyte, leucocyte, and thrombocyte count of fowl blood, P. W. WETMORE (Science, 92 (1940), No. 2391, p. 386).

Normal bactericidins in sera of the domestic fowl, E. E. SCHNETZLER and S. E. HARTSELL (Ind. Expt. Sta.). (*Poultry Sci.*, 19 (1940), No. 6, pp. 431–434, figs. 2).—In the preliminary study here reported, serums of the domestic fowl were found to possess normal bactericidins against eight strains of *Salmonella pullorum*. The strains employed possessed varying degrees of susceptibility to the action of fowl bactericidins. The bactericidal action of the serums was less when tested with those strains of *S. pullorum* most recently isolated. The individual variation among hens in percentage of organisms killed was wide, ranging

from 9.6 to 85.9 percent. Against the strains of *S. pullorum* used, the serums of White Leghorns were found to possess greater bactericidal action than the serums of Rhode Island Reds. The mean percentage of organisms killed by bactericidins in the serums of White Leghorns was 63.8 percent, while in the Rhode Island Reds it was 45.3 percent.

Anthelmintic value of tobacco midrib powder mixed with the daily feed mash of infected chickens, Z. DE JESUS and D. J. CABRERA (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 3, pp. 251-261, pl. 1).—A description is given of a practical and economical method of expelling tapeworms and roundworms of poultry. Mixed with the daily feed mash of mature fowls, tobacco midrib powder, in doses of from 4 to 5 gm. (1 heaping tablespoonful) in combination with from 5 to 7 gm. (1 heaping teaspoonful) of sodium sulfate and given for from 3 to 7 days, was found efficacious in expelling not only the common intestinal roundworms but also the tapeworms. As an anthelmintic, tobacco midrib powder is not as good a taeniasuge as when given in combination with a saline purgative, and it is more effective against roundworms than against tapeworms. The observations have shown that this method does not reduce the egg production and thus can be used for laying hens.

Arthropod intermediate hosts of *Acuaria hamulosa* in the Philippines, I. P. G. REFUEZCO (*Univ. Philippines, Nat. and Appl. Sci. Bul.*, 7 (1940), No. 4, pp. 407-414, figs. 3).—Search was made for intermediate hosts of the gizzard worm *A. hamulosa*, a parasite of poultry in various parts of the world which was found to infect as high as 20 percent of the chickens examined. Two grasshoppers, *Aeolopus tamulus* (F.) and *Oxya sinensis* Walk., were discovered to act as such, *A. tamulus* for the first time and *O. sinensis* previously recorded from Hawaii. Larvae from 18 to 20 days old parasitized birds that were fed infected grasshoppers. Eggs were recovered from the droppings in from 85 to 96 days.

Coccidiosis in the laying flock, E. M. DICKINSON. (Oreg. Expt. Sta.). (*Nulaid News*, 18 (1940), No. 7, pp. 8, 9).

A study of aqueous colloidal sulphur in the control of *Eimeria tenella* in the fowl, C. D. CARPENTER. (Univ. Ky.). (*Poultry Sci.*, 19 (1940), No. 6, pp. 371-379).—Report is made of experiments conducted with aqueous colloidal sulfur solution with the following composition of solids, to determine its value in preventing and curing coccidiosis: Colloidal sulfur 3.85, yellow sulfur 2.28, and milk of sulfur 0.10 percent. It was found that a "1 percent aqueous colloidal sulfur solution in the drinking water did not protect chicks against mass doses of 100,000 sporulated *E. tenella* oocysts when given simultaneously nor after chicks had received this amount of sulfur for 1 week prior to inoculation. One percent aqueous colloidal sulfur solution administered in the drinking water for 10 days prior to inoculation failed to protect against graded mass doses of from 7,500 to 50,000 oocysts. Thirty percent aqueous colloidal sulfur in the mash protected chicks against mass doses of from 1,500 to 15,000 oocysts but interfered with growth and produced fatal nephritis. Ten percent aqueous colloidal sulfur solution in the mash provided protection against these same doses, with little evidence of kidney involvement, and did not adversely affect growth during the 24-day period. Fifteen thousand sporulated *E. tenella* oocysts failed to produce any appreciable hemorrhage or lesions of coccidiosis when the mash contained 3 parts of an aqueous colloidal sulfur which analyzed 10 percent total sulfurs and was fed for 5 days previous to inoculation, and 7 parts protected against 25,000. Exposure to natural infection for 29 days in the brooder house failed to produce lesions of coccidiosis in chicks when the mash contained 10 parts of a 10 percent aqueous colloidal sulfur."

Quantitative studies on size, variability, and growth rates of oöcysts of different strains of avian malaria, C. G. HUFF (*Amer. Jour. Hyg.*, 32 (1940), No. 3, Sect. C, pp. 71-80, figs. 2).

Active and passive immunity in chickens against *Plasmodium lophurae*, W. H. and L. G. TALIAFERRO (*Jour. Infect. Diseases*, 66 (1940), No. 2, pp. 153-165, figs. 3).—The authors have found that "infections begun with large numbers of *P. lophurae* in young chickens are characterized by an acute rise in numbers of parasites which is terminated by a sharp crisis and followed within a few days by latency. Ordinarily, latency is not interrupted by relapses, but parasites can be demonstrated for 4 mo. (the longest period tested) by the subinoculation of large quantities of blood into normal chickens. Asexual reproduction lacks synchronicity. Infections started with small numbers of *P. lophurae* in young chickens are slow in developing, are usually low in intensity, and do not generally exhibit a sharp crisis. There is a well-defined age immunity to the infection. During latency there is a marked immunity to superinfection as evidenced by the fact that when large numbers of parasites are introduced they are removed within 2 to 4 days. Acquired immunity can be passively transferred to normal chickens provided sufficient doses of immune serum (from latently infected chickens) are used and continued over a sufficient period. In successful experiments serum was given for 9 days, which included the period of the acute rise of the infection. Incubating immune serum with parasites at 37° C. for 2 hr. and injecting the mixture into chickens greatly enhances the protective action of the immune serum as compared to injecting serum and parasites without incubation."

Observations on the biology of *Plasmodium gallinaceum* Brumpt, 1935, in the domestic fowl, with special reference to the production of gametocytes and their development in *Aedes aegypti* (L.), W. H. R. LUMSDEN and D. S. BERTRAM (*Ann. Trop. Med. and Parasitol.*, 34 (1940), No. 2, pp. 135-160, figs. 6).

Immunization against pox in domestic fowl, R. GRAHAM and C. A. BRANDLY (*Illinois Sta. Bul.* 470 (1940), pp. 76, figs. 11).—This contribution is presented in two parts, the first (pp. 4-34) consisting of a review of the literature, of which five pages of references are listed (pp. 72-76), and the second (pp. 34-69) dealing with experiments conducted in the State. Included are experiments on fowl pox immunization with pigeon pox virus, antidiphtherin vaccination against fowl pox, use of the vaccine virus in immunizing against fowl pox by the feather-follicle method, value of chemically treated pigeon and fowl viruses in vaccination against fowl pox, fowl pox immunization of day-old chicks with fowl pox virus, pigeon pox immunization with fowl pox virus, and fowl pox and pigeon pox viruses in vaccination of pullorum-exposed chicks. The practical application of the findings are summarized as follows: "Potent fowl and pigeon pox vaccines properly administered to healthy fowls produce a measurable immunity against fowl pox. The immunity induced by the application of fowl pox vaccine, stick method, is of longer duration and better defined than the immunity induced by the application of pigeon pox vaccine by the feather-follicle method. Pigeon pox vaccine can be used with less risk than fowl pox vaccine, but it provides only a modified protection against the disease. In fact, fowls vaccinated with pigeon pox vaccine may, upon subsequent exposure, develop lesions, but the systemic disturbance accompanying the unaltered virus infection is appreciably modified and often avoided. It seems inadvisable to vaccinate laying flocks not exposed to fowl pox with fowl pox vaccine, though pigeon pox vaccine can be employed (feather-follicle method) without exciting harmful effects. On contaminated premises vaccination of fowls 4 to 8 weeks

old is recommended. In some cases it may be desirable to precede fowl pox vaccination by the application of pigeon pox vaccine. Under many conditions pigeon pox vaccine may provide a practical degree of protection against natural exposure to fowl pox. The method of application, together with the age of the birds and the general health of the flock at the time of vaccination and immediately thereafter, may largely influence the results."

Roup vaccine, T. TOPACIO and E. S. SALAFRANCA (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 3, pp. 225-234).—Recent advance in the knowledge of the etiology of roup is reviewed, and the method of preparation of roup vaccine and its value are discussed. Field experiences with extensive use of roup vaccine for the prevention and control of roup infection have proved satisfactory.

Sarcocystis in birds, A. B. ERICKSON. (Minn. Expt. Sta. et al.). (*Auk*, 57 (1940), No. 4, pp. 514-519, pl. 1).—This contribution includes a list of avian hosts of the genus *Sarcocystis* arranged by orders and families, together with a list of 28 references to the literature cited.

A redescription of *Trichomonas gallinarum* Martin and Robertson, 1911, from the chicken and turkey, E. A. ALLEN (*Helminthol. Soc. Wash. Proc.*, 7 (1940), No. 2, pp. 65-68, fig. 1).

Further observations on blood protozoan infection in turkeys, J. L. WEST and L. E. STARR. (Ala. Polytech. Inst.). (*Vet. Med.*, 35 (1940), No. 11, pp. 649-653).—Report is made of an affection of turkeys that occurred during the summer of 1938 in a large flock in Alabama and was found to be due to *Leucocytozoon smithi*. Outbreaks of the disease are said to have been reported from nearly all sections of the State during the 2 yr. preceding.

Pullorum disease in turkeys, W. R. HINSHAW. (Univ. Calif.). (*Calif. Turkey News*, 1939, Sept., pp. 5-7).

A new *Salmonella* type isolated from turkeys: *Salmonella californica*, P. R. EDWARDS, D. W. BRUNER, and W. R. HINSHAW. (Ky. and Calif. Expt. Stas.). (*Jour. Infect. Diseases*, 66 (1940), No. 2, pp. 127-129).—Description is given of a new serologic *Salmonella* type designated as *S. californica*, which possesses the antigenic formula IV XII:gmt. It is represented by seven cultures isolated from two distinct outbreaks of paratyphoid infection fatal to poults in California.

The *Acanthocephala* of wild ducks in central Illinois, with descriptions of two new species, H. J. VAN CLEAVE and W. C. STARRETT. (Univ. Ill.). (*Amer. Micros. Soc. Trans.*, 59 (1940), No. 3, pp. 348-353, pl. 1).—A report is made of the systematic results of a field collection of the worm parasites of wild ducks in central Illinois from October 21 to November 21, 1935. The digestive tracts of 56 ducks representing 8 species were examined in the laboratory. Twenty-one of the birds representing 5 species were found parasitized by *Acanthocephala*, five species of which are represented in this material, and 2 described as new, namely, *Polymorphus cucullatus* and *P. acutis*. *P. minutus*, a species widely distributed in Europe, is here recorded for the first time from a North American host. *Corynosoma constrictum* and *P. marilis*, characteristic species of American ducks, are recorded from new hosts and a new locality.

Two apparently fatal grouse diseases, I. M. COWAN (*Jour. Wildlife Managt.*, 4 (1940), No. 3, pp. 311, 312, pl. 1).—Reference is made to two apparently fatal diseases of grouse in British Columbia, namely, scabies, due to scaly leg mite in the ruffed grouse (*Bonasa umbellus sabini*) and California quail, and avian cancer in the sooty grouse (*Dendragapus fuliginosus fuliginosus*).

The parasites of the sage grouse (*Centrocercus urophasianus*), F. SIMON. (Wyo. Expt. Sta.). (*Wyo. Univ. Pubs.*, 7 (1940), No. 5, pp. 77-100, figs. 16).—

A descriptive list of the known parasites of the sage grouse, including the essentials of the original descriptions and supplementary descriptive materials, comments, measurements, and reproductions of photographs, etc. Seventeen references to the literature are listed.

Causes of juvenile mortality of the ringneck pheasant [*Phasianus colchicus torquatus*], P. E. RANDALL (Pa. Expt. Sta. et al.). (*Pa. Game News*, 11 (1940), No. 3, pp. 10, 11, 28, figs. 3).

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Pennsylvania Station] (*Pennsylvania Sta. Bul.* 399 (1940), pp. 3-5, fig. 1).—Data designed to clarify the principles of hitches for tillage machinery have been obtained by A. W. Clyde, who also reports means for reducing plow damage. The advantages and dangers of electric fencing are briefly discussed by J. E. Nicholas and F. L. Bentley, and observations of variations in the capacity of feed mills are noted by Nicholas.

A laboratory study of the drainage requirements of sweet clover, P. W. MANSON (*Minnesota Sta. Tech. Bul.* 144 (1940), pp. 28, figs. 17).—Experiments here described showed that biennial white sweetclover can be satisfactorily grown in the laboratory under artificial light if the heat developed by the lamps is intercepted by a water filter placed between the lamps and the plants. The drainage experiments were carried out in this way.

The growth of sweetclover was definitely stimulated by good drainage, but the plant was grown successfully on soils known to be drained too poorly for satisfactory results with many farm crops. The growth of young sweetclover from 5 to 7 in. high was not retarded by a water table only 3 in. below the surface for periods up to 2 weeks if afterward the ground water was lowered. If continuously grown on a 3-in. water table, the matured crop required a growing period to produce a given yield 50 percent longer than that required when the water table was lowered sufficiently to permit a normal rooting depth for this plant. A stand of young sweetclover from 8 to 9 in. high was not killed when the water was raised to within 1 in. of the surface but continued to grow at a much reduced rate. Water brought above the surface caused the plant tissue to break down within 2 weeks. Sweetclover was found so water tolerant that no great difference in growth and yield between drainage depths of 18 and 27 in. could be detected. Sweetclover flooded for 1 day after cutting and then drained at the rates of 0.25, 0.5, and 1 in. per day showed marked increases in rate of growth and yields with the increase in rate of drainage through 30 days.

Dynamometer tests of draft horses, R. W. PHILLIPS, M. A. MADSEN, and H. H. SMITH (*Utah Sta. Cir.* 114 (1940), pp. 14, figs. 5).—The study reported in this circular is based on records of 2,485 entries in pulling contests in Utah and southern Idaho during the years 1931-39. The average body weight of all teams entered was 2,872 lb. The average tractive pull recorded was 2,385 lb. The correlation between body weight and tractive pull for the entire group was 0.6, ranging in individual years from 0.56 to 0.65. The regression, indicating the increase in tractive pull for every 100 lb. increase in body weight was 64.8 for the entire group and varied from 55.8 to 84.4. The usefulness of dynamometer records is discussed, and the need for studies of the relationship between these records and ability to do farm work is emphasized.

AGRICULTURAL ECONOMICS

[Investigations in agricultural economics by the North Dakota Station], W. L. ETTESVOLD (*North Dakota Sta. Bimo. Bul.*, 3 (1940), No. 2, pp. 15-18, 23,

24, figs. 4).—An article, *Livestock Cycles in North Dakota, 1888-1940*, includes and discusses charts by years showing indexes of purchasing power (1910-14) = 100) of beef cattle, dairy cows, sheep, hogs, horses, and mules. The usual comparisons of prices received by North Dakota farmers are made for September and October 1940 and October 1939.

[Investigations in agricultural economics by the Pennsylvania Station, 1940] (*Pennsylvania Sta. Bul.* 399 (1940), pp. 56-59, 60, 61, fig. 1).—Included are (1) a chart, by J. E. McCord, showing the average labor income by years 1931-39 on farms in Centre County, from which a total of over 1,600 individual yearly farm management records were obtained; (2) a table, by D. H. Walter, showing the labor incomes in 1934 and 1938 on 102 farms grouped by type of farm (small dairy, large dairy, poultry, and general) and by whether there was co-operation or not with the Soil Conservation Service at its Crooked Creek project in Indiana and Armstrong Counties; (3) tables, by C. W. Pierce, showing estimated total sales by months, 1938 and 1939, of pasteurized milk for fluid use in Allegheny County, and the use of fresh and evaporated milk per person per week for different purposes in 99 families in Johnstown, Pa., in June 1939; and (4) brief statements, by W. R. Whitacre, showing an increase from 7 to 32 in the cold-storage locker plants from 1938 to 1940, an average rental for lockers of approximately 6 cu. ft. of \$8 to \$10 per month, and a percentage of patrons that are farmers of 70.

Land classification to aid the appraiser, C. H. HAMMAR (Univ. Mo.). (*Jour. Land and Pub. Util. Econ.*, 15 (1939), No. 3, pp. 277-286).—"The purposes of this article will be (1) to describe very briefly the types of land-classification information now available to the appraiser, (2) to attempt a critical estimate of the usefulness of certain of these, (3) to point out particular developments in the technics and methodology of land classification which have some promise from an appraisal point of view, and (4) to suggest the information that a land-classification system should provide in order to be of maximum usefulness to appraisers."

Public land acquisition in a national land-use program.—I, **Rural lands** (*Washington: Govt.*, 1940, pp. V+25).—In this report to the President, the land committee of the National Resources Planning Board "has indicated the role of land acquisition among other instruments of land use adjustment, has set up criteria and objectives to guide land acquisition activities, and has recommended methods of integrating the land acquisition activities of Federal agencies and different levels of government."

Rural land holdings in South Carolina, G. H. AULL (*South Carolina Sta. Bul.* 331 (1940), pp. 23, figs. 10).—This study was made to ascertain facts regarding the ownership of rural land holdings in South Carolina as to type of owner, size of separate holdings, and assessed value distribution. The data, which were for the year 1938, were obtained from the tax rolls in 43 of the 46 counties of the State and included 141,355 rural properties. The data are analyzed by counties and by type-of-farming areas. The findings are presented in tables, charts, and maps and discussed. Of the 141,355 properties classified, 95.9 percent were reported to have been held by individuals. These properties represented 87.7 percent of the total acreage of 15,760,639 acres and 88.7 percent of total assessed valuation of \$87,513,402.

Seventh annual report of the Farm Credit Administration (*Farm Credit Admin.* [U. S.], *Ann. Rpt.*, 7 (1939), pp. VI+260, figs. 19).—This report covers the operations of the Federal land banks, national farm loan associations, production credit corporations and associations, Federal intermediate credit banks, banks for cooperatives, the Federal Farm Mortgage Corporation, Land Bank

Commissioner loans, emergency crop and feed loans, the organizations in liquidation, regional agricultural credit corporations, agricultural credit corporation stock purchase loans, the Agricultural Marketing Act revolving fund, joint-stock land banks, and the several divisions of the Washington office of the Administration.

Montana farm real estate mortgage indebtedness, R. R. RENNE (*Montana Sta. Bul. 333 (1940), pp. 40, figs. 21*).—"The purpose of this bulletin is to indicate the extent to which Montana farms and ranches are in debt, the types of lenders who have loaned most of these borrowed funds, the trend in the amount and character of the loans made during the last two decades, and related information which will furnish the basis for determining the scope and character of farm credit problems in Montana in the years ahead." It is based on data as to real estate mortgages compiled from the clerk and recorders' office in each of the counties of the State, and from records of selected lending agencies. A detailed analysis was made of all mortgages outstanding as of July 1, 1936, and an estimate was made of the total farm and real estate indebtedness outstanding July 1, 1940, based on the records of selected lending agencies. The factors affecting credit maladjustments in the State are discussed, and some suggestions made for improving farm credit practices.

On July 1, 1940, Montana farmers owed approximately \$60,000,000. Of the farms in the State, 41.1 percent were mortgaged, the average loan being \$6.02 per acre, or more than 75 percent of the average per acre census value. Nearly half (45.1 percent) of the farm real estate indebtedness is made up of Federal land bank and land bank commissioner loans; 16.9 percent by loans of resident individuals; 9 percent by loans of resident commercial banks; 8.1 percent by loans of individuals in other States; and 20.9 percent by loans of nonresident mortgage companies, insurance companies, and other agencies. Approximately half of the loans were for less than 10 yr. The interest rate on 52.8 percent of the loans was 6 percent or more, and that on 26 percent, 8 percent or more. Of the loans, 37.1 percent were of the straight-term type and 51.6 percent provided for amortized repayment. Straight-term loans running less than 10 yr. and bearing interest in excess of 6 percent had comparatively unsatisfactory repayment records. The average amount of the loans was about 87 percent of the average productivity value of the land mortgaged. Of the 11 principal types of lending agencies, 8 have loaned in excess of 100 percent of the true productivity value and 2 in excess of 150 percent. Methods suggested for the lessening of farm credit problems in the State are the making of loans on the basis of the long-time earning capacity or productivity value of the land, as measured by average yields and prices, together with a scientific soil survey; loaning on a long-term basis with annual payments adjusted to current income; incorporating improved land use and farm management practices in the mortgage contract; and effecting a strong credit educational program to familiarize borrowers and lenders of the consequences of unwise credit practices.

Measuring inequalities in farm property assessments in Maryland, W. P. WALKER and E. E. MILLER (*Maryland Sta. Bul. 435 (1940), pp. 40*).—"This is the first of a series of bulletins dealing with farm property tax problems in the State. The major purpose of the bulletin, which deals with conditions prior to the reassessment of 1937-39, is "to point out differences resulting from a variation in the statistical treatment of the same data, as well as the possibility of using several criteria to describe the assessment levels and inequalities." Some consideration is also given the problem of adequate and representative sampling in determining assessment inequality among individuals

and between governmental units. Particular attention is given to assessments of real estate and livestock. Value of property is the major basis used in comparing assessments on real estate. Yields of crops, money income, cost of building construction, extent of rate classification for land, and composite factors of soils, roads, and yields were also used to measure inequalities of real estate assessment. For livestock, the variations in percentages of livestock assessed and ranges in assessed values were used as the basis for comparisons. Assessments for each type of land, buildings, and livestock, farm real estate sales data, and estimated costs of constructing farm buildings (one county) were obtained from county records. Data for farm values, number of farms, crop yields, and number of livestock were obtained from the 1935 United States Census of Agriculture. Individual farm yields of wheat were secured from the U. S. D. A. Agricultural Adjustment Administration, and individual farm crop yields and financial returns from the farm management records of the university. The analyses and discussions as to real estate assessment cover kind of sale, sampling, method of analysis, influence of size of sale and of value per acre, and census values as compared with assessed values. The influence on assessed values of wheat yields, composite yields, composite economic productivity, the relation of estimated cost of constructing farm buildings, the interrelation between acre yields, road facilities, and assessment, and land assessment practices in relation to equality of assessments are discussed. The number of livestock assessed is compared with the number of farms and the number of livestock shown by the 1935 census, and the range in assessment rates per head and the reasons for livestock being removed from the assessment rolls are described.

The ratio of assessed to sales value (7 counties) for the period 1933-35 ranged from 81 to 132 percent, averaging 99 percent, for bona fide voluntary sales; from 98 to 179 percent, averaging 137 percent, for administrators, executors, and assignors sales; and from 105 to 172 percent, averaging 142 percent, for foreclosures and other distressed sales. "Summary data for sales to assessed ratios show that the coefficients of dispersion and variability range among the counties from 30 to 48 and from 43 to 61, respectively." Individual ratios for the 807 bona fide voluntary sales varied from 15 to 603 percent, and generally there was a wider range for properties of small value than for the higher valued properties. Farms with a sale value of less than \$20 per acre were assessed about twice as high a ratio as farms with a sale value of \$80 or more. Inequality of assessment was greatest when measured on the sale value basis than when measured by other bases. The best degree of equality was obtained when a single factor, such as yield, kind of road, or cost of construction of buildings was used as a guide for assessing. It was found that there was no continuity of policy or uniform basis for assessing between election districts within a county or between counties; that different statistical methods may be advisable in determining ratios of assessments among political units in contrast to ratios among individual properties; and that inequalities increase between reassessment because of inadequate or improper adjustment to changes in condition of real estate and failure to completely list and hold personal property accounts for livestock.

Forest land taxation in Michigan, A. Z. NELSON (*U. S. Dept. Agr., Forest Serv., 1940, pp. [6]+46, pl. 1*).—This study, covering the period 1929-38, was made for the purpose of appraising the rural land tax situation in the State, with special reference to forest land. Particular attention is given to the effects (1) of the constitutional amendment of 1932 limiting the total combined tax rate in any township to 15 mills and (2) of the special forest tax laws

on tax burden and on the practice of forestry. The trends in tax burden on rural land, the local forest tax situation, the effects of special forest tax legislation, chiefly the wood-lot law of 1917 and the Commercial Forest Reserve Act of 1925 and its amendments, are discussed.

Farm outlook: Illinois 1941 (*Ill. Agr. Col. Ext. Cir. 511* (1940), pp. 8).—Forecasts are made as to the supply, demand, prices, etc., of different farm crops, kinds of livestock, livestock products, and forest products; prices for equipment, supplies, and labor; net cash income; etc. The basis of the different forecasts are briefly discussed.

Italian agriculture under Fascism and war, N. W. HAZEN (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr.*, 4 (1940), No. 11, pp. 627-702, figs. 13).—The physical background, importance, organization, and Government control of agriculture in Italy, the production of different crops and livestock, the foreign trade in agricultural products, the Fascist agricultural policy, and Italian agriculture and the war are described and discussed.

"Agriculture is Italy's most important enterprise, engaging about 48 percent of the country's gainfully employed population. When the Fascists came to power in 1922, they had no definite agricultural policy; yet after 18 yr. of experimentation they have developed, as a means of attaining economic self-sufficiency, one of the world's most rigid systems of control over farm production and trade. Italy, however, still must depend on the outside world for many vital agricultural products. For this reason, the British blockade has more severely disorganized the Italian economic structure than has any other measure taken during the war.

"One result of Italy's participation in the present conflict has been to cut off almost completely its trade with the United States and to reduce substantially American trade with all countries of the Mediterranean Basin. Unless war conditions in that region are eased, there is danger that all United States trade with the Mediterranean countries may be further curtailed."

Types of farming in Mississippi, M. A. CROSBY. (Coop. Miss. Expt. Sta.). (*U. S. Dept. Agr., Bur. Agr. Econ.*, 1940, pp. [2]+126, figs. 42).—This study was made "(1) to delimit the different type-of-farming areas in the State and portray the character of farm types within these areas in terms of source of income, selection of enterprises, and farm practice; (2) to trace insofar as possible past changes in character of farming and indicate recent trends in crop and livestock production; and (3) to identify and evaluate the relative importance of physical, social, and economic forces which have and are now shaping the type of farming in the various areas." The basic data were obtained largely from the 1930 United States Census, various bureaus of the Department of Agriculture, the Mississippi State Tax Commission, the Mississippi Experiment Station, county agents, farmers, businessmen, etc. The early agriculture in the State and the recent trends and the physical, biological, and economic forces affecting agriculture in the State are discussed. Maps show the utilization of land, distribution of crops and livestock, distribution of different types of farms, etc. The State is divided into 10 type-of-farming areas, with subareas in the case of some areas, and the physical condition, land utilization, crops, livestock, types and size of farms, and farm tenure are described for each area.

Effects of strip mining on agricultural areas in Illinois and suggested remedial measures, H. W. HANNAH and B. VANDERVELT. (Univ. Ill. et al.). (*Jour. Land and Pub. Util. Econ.*, 15 (1939), No. 3, pp. 296-311, figs. 5).—The development, extent, and efficiency of strip mining, the effect on agricultural values, the complaints on such mining, and the legal basis for control in Illinois are described. Remedial measures, Government ownership, compulsory leveling

or replacement of soil, delineation of areas for stripping, severance taxes, and equitable relief are discussed.

Strategy in protecting the public's interest in land, with special reference to strip mining, C. L. STEWART. (Univ. Ill.). (*Jour. Land and Pub. Util. Econ.*, 15 (1939), No. 3, pp. 312-316).—The problem is examined from the long- and short-range angles, with a view to ascertaining how the question of present v. future incomes impinges on public welfare and what suggestions it offers for formulation of public policy.

Cooperative grain marketing by local warehouses and elevators in the Pacific Northwest, H. E. RATLIFF (*U. S. Dept. Agr., Farm Credit Admin., Coop. Res. and Serv. Div., Bul. 40* (1940), pp. IV+44, figs. 12).—Sixty of the 98 farmers' cooperative elevators and warehouses were studied during the 3 crop years 1934-35 to 1936-37. Analysis is made of the membership, volume of grain handled, control and management, the characteristics of handling and marketing grain, the corporate and cooperative features, financial status, income, expenses, and the unit costs of operation of the cooperative elevators and warehouses.

The Pacific Northwest associations are distinct from those in other regions (1) in that they were established to provide adequate and economical storage at local shipping points in a section where farm storage has been impracticable and consequently they have a substantial and steady income from fixed storage charges; and (2) they cover wider territories and 41 of the 60 associations studied operated more than one shipping point. The prevailing storage charge was 10 ct. per ton per month after 30 days' free storage. The charges for handling varied from 75 ct. to \$1.25 per ton including 1 month's free storage. The chances were that 42 out of 100 associations handling less than 150,000 bu. per year would operate at a loss. Income from side line sales apparently reduced the chances of losses but did not increase the chances for greater return on investment. Direct warehouse expenses per bushel did not vary greatly among the associations handling over 100,000 bu. per station and tended to approach 2 ct. for all associations handling 150,000 or more bushels per station. The associations warehousing less than 50,000 bu. per man-year of warehouse labor had direct warehouse expenses of more than 4 ct. per bushel as compared with 2 ct. where more than 100,000 bu. were handled per man. Utilization of warehouse capacity had a considerable effect on warehouse expenses per ton.

Financial operations of Ohio farmer owned elevators during the fiscal year 1939-40, B. A. WALLACE (*Ohio State Univ., Dept. Rural Econ. Mimeog. Bul. 133* (1940), pp. [1]+21).—This bulletin, which continues the series (*El. S. R.*, 83, p. 407), is based on the main balance sheet and income and expense items from 146 companies operating 186 plants, detailed analysis of expense items from 53 companies, commodity sales and margins from 48 companies, and accounts receivable data from 19 companies.

Potato marketing investigations, F. L. PARSONS. (Kans. Expt. Sta.). (*Kans. State Hort. Soc. Bien. Rpt.*, 45 (1938-39), pp. 155-157).—Some of the important reasons for the decline of the potato industry in Kansas are discussed, and some of the findings in a study in 1939 as to local markets, cold-storage holdings, and disposition of cull potatoes are presented.

Problems in the marketing of Kaw Valley potatoes, S. W. DECKER. (Kans. Expt. Sta.). (*Kans. State Hort. Soc. Bien. Rpt.*, 45 (1938-39), pp. 55-65, fig. 1).—The competition with Kaw Valley potatoes and the purchasing practices of purchasers are described briefly, and the results are given of some investigations of precooling and washing shipments.

Marketing Kaw Valley potatoes, S. W. DECKER. (Kans. Expt. Sta.). (*Kans. State Hort. Soc. Bien. Rpt.*, 45 (1938-39), pp. 145-153, figs. 4).—The shipment

of Kansas and Missouri potatoes to the Chicago market in 1939 and the sources of potatoes in the Chicago Produce Terminal, July 1939, are discussed. Comments of the author and others on the condition of Kansas potatoes handled on the Chicago market in different ways are included.

Cooperative marketing of dairy products, H. C. TRELOGAN and F. M. HYER (*Farm Credit Admin. [U. S.], Coop. Res. and Serv. Div., Cir. C-116 (1939), pp. [2]+47, figs. 22*).—The types and organizational structure of dairy cooperatives are discussed.

Economic analysis of the food stamp plan.—A special report, N. L. GOLD, A. C. HOFFMAN, and F. V. WAUGH (*U. S. Dept. Agr., 1940, pp. VI+98, figs. 8*).—“This report is based on a study conducted jointly by the Bureau of Agricultural Economics and the Surplus Marketing Administration.” The report is composed of sections on surpluses, nutrition, and the food stamp plan; theory and principles of the plan; scope of the plan—relation to total food sales and consumer participation: commodities purchased with blue stamps—comparison with consumption under the direct distribution program and other low-income consumption; the problem of substitution and the orange-stamp requirement; factors to be considered in selecting commodities for surplus list; costs under the food stamp plan; effect of the plan on retailers, retail margins, and employment; effect of the plan upon diets of low-income families, Dayton, Ohio, 1939; attitudes toward the plan; and national potentialities of the plan. Appendixes giving further details as to some of the analyses are also included.

Food and cotton stamp plans, M. I. HESS (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. List 18 (1940), pp. 26*).—Included are 168 selected references on the food stamp and cotton stamp plans for distribution of surplus farm commodities.

World wheat survey and outlook, [May and September] 1940 (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 16 (1940), No. 8, pp. [2]+365-402, figs. 7; 17 (1940), No. 1, pp. [2]+87, figs. 7*).—These numbers continue the series (*E. S. R.*, 84, p. 117), data for May being reported by V. P. Timoshenko and H. Working, and for September by H. C. Farnsworth and Timoshenko.

“Official statistics of exports indicate that international trade in wheat has been larger than expected, apparently owing principally to large Italian and German takings. . . . Wheat prices in Canada were extraordinarily stable from January to mid-May, apparently owing largely to the circumstances under which sales were made to the United Kingdom.

“War developments and governmental wheat measures overshadowed all other factors in their influence upon wheat futures markets during May–September. Germany’s successful invasion of Belgium and Holland in May was associated with spectacular price declines which were met by government-sponsored minimum price regulations. . . . Striking improvement in the outlook for the new North American wheat crop had little market influence after early May. Current estimates suggest that the wheat surplus for export and carry-over will be unprecedentedly large in North America, and perhaps in the four major exporting countries combined. In contrast, European wheat supplies are somewhat short and, in effect, shorter than their gross size would imply. The major deficit area is, as usual, in northwestern Europe. . . . World wheat exports in 1939–40 totaled well over 600 million bushels, despite contraction of the continental European market following extension of German control over the Low Countries and France.”

Wheat subsidization and exports: The experience of 1938–39, V. P. TIMOSHENKO (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 17 (1940), No. 2, pp. [2]+39-99, figs. 11*).—“Competitive subsidization of exports threatened to continue at great losses in 1939–40. This was prevented by the onset of the

European war. The war soon led to concentration of wheat buying in many of the important countries, and the problem of coping with wartime conditions made government interventions in wheat markets indispensable for all countries involved in the war."

Price relations of Liverpool wheat futures, with special reference to the December-March spread. S. HOOS and H. WORKING (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 17 (1940), No. 3, pp. [2]+101+142+[1], pl. 1, figs. 14*).—At Liverpool, as at Chicago, price influences which might seem significant principally for deferred futures are found in fact to have nearly or quite as much effect on the near future. Expectations of subsequent developments are reflected in prices of all futures about equally. Price differences between futures arise mainly from conditions and expectations that have greater price significance for the near future than for the deferred future. The price spread between the December and the March futures at Liverpool appears to have depended mainly on conditions that tend to determine the level of European stocks of imported wheat at about the end of December. The December-March spread as early as September implies a forecast of shipments during the autumn. As such, it has been reasonably trustworthy, but it has tended to underestimate the force of extreme conditions, with the result that unusually wide spreads have tended to widen as the season progressed. The influences affecting the December-March spread tend in August-October to bear principally on the price of the December future, but to affect the March future in the same direction. In November and December they tend to affect only the price of the December future.

World fresh pear production and trade. S. I. KATZ (*U. S. Dept. Agr., Off. Foreign Agr. Relat., F. S. 84 (1940), pp. [2]+51, figs. 7*).—The developments in the world pear situation for the two decades between the World War and through 1939 are covered. The world production, the international trade, and the production, exports, imports, and consumption of different European, South American, North American, Near East, and Oriental countries are discussed.

Cotton linters: Selected references in English, 1900-July 1940. E. L. DAY (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 88 (1940), pp. VI+59*).—Included are 205 selected references, 1900-July 1940, "describing methods of recovering linters, the place of linters in commerce, quality, and uses for linters. References to methods of delinting cottonseed for planting purposes are omitted."

Wholesale prices of fats and oils in the United States: Index numbers, 1910-39. R. M. WALSH (*U. S. Dept. Agr., Tech. Bul. 737 (1940), pp. 28, figs. 6*).—The index numbers of monthly and annual wholesale prices of fats and oils in the United States include three principal groups: (1) A series for eight domestic fats and oils (lard, butter, cottonseed oil, inedible tallow, linseed oil, A white grease, oleo oil, and edible tallow); (2) a series for all fats and oils (27 items), grouped according to the similarity of their physical origin; and (3) a series for all fats and oils, grouped according to similarity of use. The series for the eight domestic fats and oils begins with 1910, and the two for all fats and oils with 1922. Two base periods, 1910-14 and 1924-29, are used for the domestic series. Only the 1924-29 base period is used for all fats and oils. The prices for the domestic fats and oils are weighted by the relative production of the items during the period 1924-29. Relative consumption during 1924-29, taking into account foreign as well as domestic fats and oils, is used as the basis of weighting for all the fats and oils series. The group index numbers are described, and the dispersion among prices of the different items, the seasonal variations in the index numbers, etc., are commented on.

Prices received by North Carolina farmers, T. L. STUART and G. R. SMITH (*North Carolina Sta., AE-RS Inform. Ser. No. 6 (1940), pp. [1]+86, figs. 3*).—This bulletin, prepared in cooperation with the North Carolina Department of Agriculture, includes monthly index numbers 1909-39 of prices received by North Carolina farmers for all commodities (31) and for grains, cotton and cottonseed, tobacco, meat animals, poultry products, dairy products, and miscellaneous products; monthly price relations, 1909-38, for the 26 leading commodities of the 31 included in the group index numbers; and monthly prices, 1909-39, for the commodities included in the indexes. The method used in constructing the index numbers is described. The index numbers for several groups of commodities are discussed and compared. Comparisons are also made with index numbers for the United States for prices received by farmers, prices paid by farmers, wholesale prices of nonagricultural commodities, etc.

Crops and Markets, [October 1940] (U. S. Dept. Agr., *Crops and Markets*, 17 (1940), No. 10, pp. 209-232, fig. 1).—The usual reports are included.

RURAL SOCIOLOGY

Anthropology and agriculture: Selected references on agriculture in primitive cultures, K. MACLEISH and H. E. HENNEFUND (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog. 89 (1940), pp. XI+134*).—Following an introduction by J. H. Provinse, "this bibliography is a selected list of references to general books and articles in the field of anthropology and to work on the culture of individual peoples and communities, particularly those in which their agriculture is discussed and the man-land relationship is brought out. Its purpose is to lead research workers to sources dealing with the total culture of these peoples so that they may see the part that agriculture and food-getting activities play in it."

A memorandum on research in income and levels of living in the South, W. H. SEWELL (*Okla. Agr. Col., Social Sci. Res. Council Pub. 3 (1940), pp. [1]+30*).—The author concludes that the most apparent need in the whole field of family living is for basic research on the sociological aspects of family life in the South, and particularly on the relationship between both income levels and consumption patterns and (1) the structural and functional aspects of family organization, (2) the attitudes of family members toward each other, the community, and social institutions, (3) community organization, (4) social mobility, and (5) the various social processes. There are, of course, studies dealing directly with certain of these relationships, but in general there has been very little intensive study of them in relation to income or consumption levels either in the South or elsewhere.

Houseboat and river-bottoms people, E. T. HILLER (*Ill. Univ. Studies Social Sci., 24 (1939), No. 1, pp. 146*).—The study is based on a sample of 683 households living on or near the Ohio and Mississippi Rivers in six counties of Illinois. The sample household schedules pertain to, first, the houseboat and land squatter residents who were actually living on or by the rivers in the selected areas during February and March 1935; second, households that derived some or all of their living from the river; and third, control cases from other shelter and occupational groups.

The free squatting and floating privileges and the pursuit of the self-help opportunities supplied by the stream are survivals of the frontier traditions rather than unique adjustments induced by the depression. The self-help extractive pursuits connected with the river are continuations of frontier occupations adapted to current technologies. The continuity of traditions and behavior patterns is indicated by the high ratio of the descendants of southerners who followed the

frontier methods of self-help in improvising shelter, using the river resources, and retaining the squatter customs in the use of land. From such observations the conclusion follows that, in order to change or improve any phase of living, there is need to improve not only the environment but also the attitudes of the population concerned. Any problem as complex as the reviewed information has shown the person-environment relation to be, even in these supposedly out-of-the-way places, cannot be remedied by fiat nor in a brief span of years. Such a change requires rather the slow processes of reintegrating the same or substitute attitudes, skills, resources, and potential opportunities.

Social insurance and agriculture: A memorandum presenting suggestions for research and bibliography, W. S. HOPKINS (*Social Sci. Res. Council, Pam. Ser. No. 5 (1940), pp. [2]+V+93*).—The author discusses factors contributing toward the social insecurity of agriculture, the capacity of agriculture to support a social insurance program, and the probable consequences of programs for social insurance coverage. The text is followed by an elaborate bibliography.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

[Investigations in agricultural education by the Pennsylvania Station, 1940] (*Pennsylvania Sta. Bul. 399 (1940), pp. 59, 60*).—Brief statements are included (1) by W. A. Broyles, showing great consistency of well-trained students in livestock-judging contests, and (2) by H. S. Brunner, showing that 68 percent of 20,725 boys with one or more years of vocational agricultural instruction were farming, and 2,111 attended organized classes for instruction during the year.

Canadian farm problems (*Canad. Farm Prob., Econ. Ser. Nos. 2 (1940), pp. [2]+10; 3, pp. [2]+12; 4, pp. [2]+19; 6, pp. [2]+19*).—These publications are part of a series of 16 pamphlets prepared by the Agricultural Publications Committee of the Canadian Association for Adult Education. The purpose and nature of the pamphlets are described by the editor as follows: "This series, designed for the use of discussion club leaders, also constitutes the basis for a broadcast series over a Canadian hook-up to be initiated on January 21, 1941. It is to be used in connection with 'Listening Groups' now being organized in several provinces. The pamphlets represent a novel arrangement of material that has been used successfully with experimental groups in connection with the adult education program of Macdonald College. The title of each pamphlet is in the form of a question, and each starts out with a short introduction briefly outlining the subject and clarifying the issue involved. This is followed by a set of 'local questions,' which attempt to elicit from the group the practices currently followed in their community with respect to the problem at issue. Next, the main theme is resolved into a series of sub-questions which are briefly but not exhaustively discussed 'pro' and 'con,' with the idea of getting the discussion under way. A valuable feature is the list of annotated references at the end of each pamphlet containing factual material, points of view, etc."

No. 2 is entitled *Should Canada Restrict Farming of Submarginal Lands*; No. 3, *Will Increased Production Benefit the Farmer*; No. 4, *Should Canada Encourage Land Settlement of Immigrants*; and No. 6, *How Far Will Improved Farm Management Methods Help*.

The judging of livestock, dairy, poultry, and crops, H. O. WESS (*Mississippi Sta. Bul. 344 (1940), pp. [3]+143, figs. 131*).—This bulletin includes information for use in training future Farmers of America judging teams.

Laboratory manual of household equipment, D. DAVIS and R. M. BEARD (New York: John Wiley & Sons; London: Chapman & Hall, 1940, pp. VII+247, figs. 12).—This manual, devised as a guide for students in their study of home appliances and as a basis for class discussion of the important factors in selection, use, and care of household equipment, gives working outlines for the study of various pieces of equipment. The statement of purpose, the list of materials, and the outline of procedure are given in printed form for each experiment, together with record forms provided with blanks for filling in the observations specified in the side heads. With the preliminary details of the experiment already recorded, the student's time may be devoted to the more important matter of making and recording pertinent observations concerning the structure and operation of equipment.

Exhibits, A. M. HANNEY (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. List 17* (1940), pp. 12).—This selected list of 59 references "is composed, for the most part, of periodical articles which describe exhibits of various kinds and which attempt to evaluate their success in terms of interest evoked and sales effected."

FOODS—HUMAN NUTRITION

The state of water in colloidal gels: Free and bound water in bread doughs, G. E. VAIL and C. H. BAILEY. (*Minn. Expt. Sta.*). (*Cereal Chem.*, 17 (1940), No. 4, pp. 397-417, figs. 9).—This study, directed toward explaining changes in viscosity of flour-water systems, was concerned with the state of water in doughs as evidenced by changes in dielectric properties in progressing from the frozen to the melted state. The freezing or melting point of the doughs was determined by a modification of the Beckmann technic, involving determinations of the dielectric constant by measurement of the capacitance of a condenser under certain conditions in which the nature of the dielectric was the factor which varied. Accordingly, the change noted in the capacity of the cell with change in temperature was due solely to the change in the physical state of the dielectric (in this case, the dough).

Freezing points were determined for doughs mixed for 1-, 3-, and 10-min. periods. No significant differences were found, indicating that no change had occurred in the state of water in the dough due to variations in the degree of mixing. "Average bound-water values for the dough mixed for 3 min. were calculated. Calculations were based upon the depression of the freezing point of the doughs containing no sucrose and 0.125, 0.25, and 0.5 molal sucrose solutions. The calculated percentages of bound water at the three levels were 34.25, 36.46, and 35.06, respectively. The average calculated bound water was 35.5 percent, and the hydration capacity was 28.6 percent when calculated as bound water held per unit weight of dry matter."

The water and dry matter content in edible curd [trans. title], A. SCHLÖRMER (*Milchiv. Forsch.*, 20 (1940), No. 4, pp. 139-152).—This study summarizes for the sake of establishing regulatory standards the results of analyses in a 10-yr. period of over 500 (German) samples of commercial products of the cottage cheese type. For curds up to 9.9 percent fat (i. e., made from skim milk), solids varied from 15.0 to 25.9 percent; curds with from 20.0 to 29.0 percent fat (made from partially skimmed milk) varied from 17.0 to 28.9 percent solids, while those having from 40.0 to 49.9 percent fat (made from whole milk) varied from 22.0 to 53.9 percent solids. It is apparent that the solids varied with the fat content.

The dietary value of fruits and fruit products, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1940), No. 8, pp. 230-

233, 245, 247, 251).—This paper, presented before the American Public Health Association at its 1939 meeting, consists largely of a review of the research during the past few years at the University of California on the value of fruits and fruit products in maintaining the natural acid-base balance of the blood and tissues, promoting hemoglobin regeneration, and contributing to the content of vitamins in the diet. Other topics discussed include the public health aspects of fruits with relation to spray residue and the SO_2 content of dried fruits and the laxative principle of California prunes. An extensive list of literature citations is appended.

The use of high conversion corn sirup in making jellies, jams, and fruit butters, D. K. TRESSLER. (N. Y. State Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1940), No. 3, pp. 228, 229, 251).—Sweetose, a new high-conversion corn sirup, has been used alone or in combination with sucrose in making strawberry, red and black raspberry, cherry, blackberry, currant, grape, apple, and crab apple jellies; strawberry, red and black raspberry, currant, grape, and plum jam; and plum, peach, pear, and apple butters. The methods used are described, the composition of Sweetose is compared with that of ordinary corn sirup, and tabulated data are reported on the effect of varying sucrose: Sweetose ratios on the quality of certain jellies and on formulas and properties of some strawberry jellies made with sucrose and Sweetose alone and combined. The use of Sweetose is recommended for the following reasons:

"The nonsugar solids of this high-conversion corn sirup are as effective as sucrose in effecting jelling. Crystallization of dextrose does not occur during storage of fruit products prepared with either straight Sweetose or mixtures of Sweetose and sucrose. Fruit products prepared with Sweetose have a remarkably smooth texture and excellent spreading qualities. The fruity flavors of jellies, jams, preserves, fruit butters, and marmalades made with Sweetose are somewhat more pronounced than those of sucrose jellies. Preserves and jams made with straight Sweetose and Sweetose and sucrose blends possess a very pleasing appearance because of their high gloss."

Apple and cherry juice: Promising new outlets for Utah's fruit crops, off-grade apples and sour cherries now without a market may be used in this way, F. M. COE. (Utah Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 20 (1940), No. 3, pp. 78, 79, figs. 2).—Essentially noted from another source (*W. S. R.*, 84, p. 123).

Research on the utilization of agricultural products in California, W. V. CHAUSS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1940), No. 5, pp. 132-137, 153, figs. 2).—An address.

Quality control of quick frozen foods, D. K. TRESSLER. (N. Y. State Expt. Sta.). (*Canner*, 91 (1940), No. 13, pp. 13, 16, fig. 1).—Precautions which must be taken by the producer to insure good quality in frozen foods are discussed, with the reasons for each point.

Nutrition studies [by the New Haven Station] (Connecticut [New Haven] Sta. Bul. 438 (1940), p. 500).—Progress is reported in the study of reproduction in rats on diets of purified foods, in the critical study to determine the best method of measuring the utilization of calcium from various food mixtures, and in experiments to determine the extent of healing in rickets without the aid of vitamin D.

[Nutrition studies of the Pennsylvania Station] (Pennsylvania Sta. Bul. 399 (1940), pp. 12, 60).—Progress reports are given by F. J. Doan on the development of a new artificial digestibility method for testing the suitability of various types of modified milks for infant feeding, and by P. B. Mack and

J. Smith on an extension to rural families of the earlier-noted investigation (E. S. R., 81, p. 141) of the dietary habits and nutritional status of urban families in the State.

Bibliography of nutrition in India, N. GANGULEE (London: Oxford Univ. Press, 1940, pp. VIII+79).—This bibliography contains most of the available material on nutrition in India, including diet surveys, food analyses, and deficiency diseases; a selection of material illustrating the sources of food supply; all available budget analyses, showing amount spent on food and consumed by city and rural communities; and an indication of sources of social prejudices regarding the eating of food. A list of Indian foodstuffs is given.

The diet of some Australian schoolboys, H. S. HALCRO WARDLAW and C. J. WHITE (*Austral. Jour. Expt. Biol. and Med. Sci.*, 18 (1940), No. 1, pp. 9-20, fig. 1).—Data were obtained, (1) in the warmer and (2) in the cooler part of the year, on the daily intake of a large number of normal Australian schoolboys. From consumption records and analyses of representative food samples, the average caloric intake was calculated as 1,691 calories at 11 yr. This intake increased with age at a rate similar to the rate of increase of surface area, the average intake at 18 yr. being 2,707 calories. The corresponding range of protein intake was from 55.8 to 105.4 gm. and of ash from 10.1 to 20.9 gm. For these building materials the intake with age increased more rapidly than surface area and at a rate similar to the rate of increase of body weight. The mean value for calories was 1,588 per square meter and for protein 1.60 gm. per kilogram. "The mean composition of the food was protein 16.7 percent, fat 17.5, carbohydrate 62.7, and ash 3.1 percent. The proportion of fat was greater during the colder months of the year but the caloric value of the diet did not increase."

The authors had the assistance of R. Fisher and N. L. Wake.

Normal variation in the gastrointestinal response of healthy children, I. G. MACY, L. REYNOLDS, H. J. SOUDERS, and M. B. OLSON (*Amer. Jour. Roentgenol. and Radium Ther.*, 43 (1940), No. 3, pp. 394-403, figs. 2).—The seven children used in previously noted studies of gastrointestinal response and motility (E. S. R., 82, p. 276; 83, p. 128) served as subjects in serial roentgenographic studies of the gastrointestinal response to test meals composed of 2 oz. of barium sulfate in 4 oz. of water and in 4 oz. of milk ingested at body temperature. A second series of observations following the milk meal was made 1½ yr. after the first. The roentgenograms taken 12, 40, and 80 min. and 24 hr. after the ingestion of the test meals are reproduced for comparisons of the same subject at different time intervals and of different subjects at the same time. The gastric and jejunal emptying times, estimated from complete series of reproductions, are presented in a table, together with pertinent data from measurements on the children.

Mean values for the seven subjects were gastric emptying time water 1.9 and milk 3.1 hr., and jejunal 2.4 and 3.4 hr., respectively. Individual differences were marked but consistent for both types of meals. There were no consistent significant differences in the emptying time of the colon as shown in the 24-, 48-, and 72-hr. roentgenograms, indicating that adjustments to the emptying times of the stomach had taken place in the small intestine within 24 hr. The values obtained for the milk meal after an 18-mo. interval were not consistent for the individual subjects with the earlier values. The average of the gastric emptying time was increased and of the jejunum decreased, the values being 3.6 and 3.2 hr., respectively. It is suggested that the individual variations may have been due to physiological changes coincident with growth or possibly to less complete preliminary standardization of the subjects.

Health and development of a group of nursery school children, J. B. McCAY, E. B. WAXING, and H. D. BULL (Cornell Univ.). (*Child Developmt.*,

11 (1940), No. 2, pp. 127-141).—This paper reports an extensive study of 66 children (12 1/2 a year) enrolled in the junior nursery school of the New York State College of Home Economics during the 5-yr. period of 1932-37. Physical and medical examinations and mental-development tests were given the children on enrollment and at the end of the year, and during the entire enrollment frequent growth measurements were made and almost daily records were kept of eating and sleeping behavior, outdoor play, elimination, and sickness. Wherever possible the data obtained were classified in terms of median scores representing average performance, interquartile range to describe variations of the middle levels, and total range to mark the outer boundaries of the group. There were 31 girls and 35 boys in the group, with ages at enrollment ranging from 1 yr. 11 mo. to 3 yr. 3 mo. and averaging 2 yr. 7 mo. The middle 50 percent (interquartile range) were between 2 yr. 4 mo. and 2 yr. 10 mo., and the median ages for the girls and boys were the same. The findings are discussed in sections dealing with infant development, status at beginning nursery school, and development during the school year. In summary, a description is given of the composite or average child of the group with respect to all of the items studied, and the three classes of numerical data are tabulated, thus furnishing convenient standards for comparison.

Ten "good" eaters and ten "poor" eaters, J. B. McCAY and H. D. BULL. (Cornell Univ.). (*Jour. Ped.*, 17 (1940), No. 2, pp. 230-240).—From the records obtained in the extensive study of health and development of the group of nursery school children referred to above, those of 10 children classified as good eaters and 10 as poor eaters were selected for a comparison of early infant histories, physical examination on beginning school, and behavior relevant to nutrition and health during the school year. The group of good eaters was comprised of 5 boys and 5 girls and the poor eaters of 7 boys and 3 girls. The average age of the children in the first group was 30.1 and in the second 30.2 mo. at the beginning of school.

The two groups were similar in the age of their mothers at the birth of the children; infant schedules and feeding practices; arrival of teeth; beginning of walking and talking; bony structures and posture, with the exception of more "winged" shoulders in the group of poor eaters; evidence of infected tonsils; amount of absence for sickness, although the group of good eaters lost more days because of colds and of poor eaters more because of digestive difficulties; and amount of sleep in 24 hr., although the poor eaters had fewer and shorter naps and equal gains in weight. Among the differences noted were smaller birth weights and weights on entering school of the poor eaters, inferior tone and musculature, a tendency toward anemia, poorer coordination of the eyes, occasional appearance of sugar in the urine, lower ratings in mental tests, more digestive difficulties, and more restless activities at meals. The good eaters showed more skin patches diagnosed as eczema and more roughened skin, more prominent abdomens, and a greater tendency to enuresis. Certain of the findings suggest the influence of unfavorable home environment in the group of poor eaters.

The mystery of alimentation, I, II, E. P. CATHCART (*Lancet* [London], 1940, I, Nos. 12, pp. 533-537; 13, pp. 586-590).—In these Oliver-Sharpey lectures delivered before the Royal College of Physicians of London, March 12 and 14, 1940, the author discusses the inadequacy of present knowledge concerning many of the fundamental processes governing the utilization of food in the body, selecting for particular consideration protein and calcium-protein "because it holds an unique position in alimentation as almost the only source of the requisite nitrogen" and calcium "because most attention has been, in modern times, devoted to a study of this mineral because it is so intimately associated with the apparently static skeletal structure and because so much

weight has been laid on it as a kind of gage of the adequacy of a diet." Assumptions unwarranted in the light of existing knowledge, controversial views, and unexplored problems, particularly those concerned with interrelationships among the various food constituents, are discussed, and new lines of inquiry are suggested through numerous questions.

"The problems are endless. We indeed see through a glass darkly; yet every day pronouncements are brazenly made about the adequacy of this and the inadequacy of that diet or the degree of malnutrition which is due to the absence of this or that essential constituent from the diet. Mendel was right when he wrote: 'There is no field of practical importance related to human well-being in which there is greater opportunity for dogmatism and quackery, for pseudoscience and unwarranted presumptions and proscriptions, than in the domain of our daily diet.'"

Some modifications of the paired-eating method in meat cookery research, S. COVER. (Tex. Expt. Sta.). (*Food Res.*, 5 (1940), No. 4, pp. 379-394).—A paired-eating method, the essential features of which are that paired samples be provided and that these be judged by comparison with each other, is presented. A description is given of the method as used in testing tenderness of meat; and the setups of the sampling sheet, which is really a code followed in placing the samples on the plates of the individual judges, of the judging sheet for tenderness, and of the summary sheet are shown. As an illustration of the method, one complete set of actual data is recorded on the forms, and the process is discussed. Statistical treatment, which may be done simply in a short period of time either by the binomial method or the method of chi square, is presented for the data reported, using the chi-square method. The method is considered generally applicable "to those studies in which the major interest is concentrated on observing the effect of the extremes of one independent variable on one factor of palatability as the dependent variable." The method as originally given has been noted (E. S. R., 76, p. 126).

The nutritive value of the proteins of rice and its by-products.—II, Effect of amino acid additions on growth, M. C. KIRK. (Univ. Ark.). (*Cereal Chem.*, 17 (1940), No. 4, pp. 473-476).—In continuation of studies noted previously (E. S. R., 81, p. 867), the supplemental effect of various amino acids with regard to the nutritive quality of rice proteins was studied. The various rations, adequate as to minerals and vitamins, employed whole rice, polished rice, rice polishings, or rice bran at levels sufficient to supply 6.0 percent, 5.5, 8.0, and 8.0 percent of protein, respectively. Paired feeding experiments showed that cystine, methionine, and lysine supplemented the proteins of whole or polished rice to a slight but statistically significant extent. Tryptophan had no beneficial effect, and a "leucine fraction" used with the polished rice was without effect. Cystine, as a supplement to the proteins of rice bran and rice polishings, failed to promote growth.

Effect of changes in food intakes upon the lignin, cellulose, and hemicellulose contents of diets, F. C. HUMMEL, M. L. SHEPHERD, and I. G. MACY (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 3, pp. 199-207).—Data are reported for the total fiber, cellulose, hemicellulose, and lignite content, as determined by methods noted, of 14 common foods used in the experimental diets. In the dietary studies reported in detail the effect of altering the proportion of cellulose, hemicellulose, and lignin in the diet was observed in 9 normal children by the addition or substitution for cereal of 100 gm. of banana per day. Differences in the quantities of apple included in the diets of the different groups permitted comparison of the effects produced by similar quantities of

total fiber whose proportional composition varied. The apples contained a higher proportion of cellulose and hemicellulose but a lower proportion of lignin than the bananas.

Each child was given quantities of food suitable to meet his own dietary needs, and each subject served as his own control during preexperimental periods of from 30 to 55 consecutive days, immediately followed by experimental periods of from 20 to 45 days. From the data presented on intake and retention of nitrogen and on intake of total fiber, lignin, cellulose, and hemicellulose in the preexperimental and experimental periods, it appears that "there are other motivating factors besides quantity intake of nitrogen which produce increases in nitrogen retention and growth of soft tissue when conservative amounts of banana (from 100 to 200 gm. per day) are added to the diet. This study indicates that the unavailable carbohydrates may have a protein-sparing action, and that the character of the fiber (i. e. the proportion of lignin to cellulose and hemicellulose) may have physiological importance in the diet."

Influence of raw banana and apple upon disappearance of complex carbohydrates from the alimentary tracts of normal children, M. L. STEPHARD, F. C. HUMMEL, I. G. MACY, ET AL. (*Amer. Jour. Digest. Diseases*, 7 (1940), No. 6, pp. 248-252).—The dietary studies reported in this paper are essentially noted in the above study.

Hematologic values for normal children three, four, and five years of age living in Hawaii, C. J. HAMRE and K. K. L. WONG. (*Hawaii Expt. Sta.*). (*Amer. Jour. Diseases Children*, 60 (1940), No. 1, pp. 22-35, fig. 1).—Hematologic values were determined for 179 healthy children (89 girls and 90 boys) from 3 yr. 6 days to 5 yr. 338 days in age and resident in the Hawaiian Islands for at least 1½ yr. before the examinations. The children were of several races (Caucasian, Chinese, Japanese, Korean, Hawaiian, and mixed) and came from families of average means. The determinations, made on peripheral blood by methods noted, included red cell, platelet, and differential white cell counts and determinations of hemoglobin, packed red cell volume, corpuscular volume, and corpuscular hemoglobin concentration.

The data, reported by races and again according to age and sex, indicated, upon statistical analysis, that no differences occur in respect to these factors. The mean values (reported, together with statistical constants and the range of observed values) compare closely with values summarized from the literature and pertaining to children in various parts of the world. "It is concluded that the blood levels for the children of the Hawaiian Islands do not differ significantly from those for children of other parts of the world."

Minerals in nutrition (Massachusetts Sta. Bul. 374 (1940), pp. 40, figs. 2).—The studies reported in this bulletin were undertaken to gain some factual evidence of the degree and nature of certain mineral deficiencies, and include the following: Total Nutrients and Minerals in Human and Cattle Foods, by W. S. Ritchie and E. B. Holland; The Absorption by Food Plants of Certain Chemical Elements Important in Human Physiology and Nutrition, by W. S. Eisenmenger and K. J. Kuciński; Possible Relationship of Vitamin C and Arthritis, by W. B. Esselen, Jr., and O. R. Fellers; The Effect of Kelp and Mineral Supplements on Atherosclerosis in Rabbits Induced by Feeding Cholesterol, by H. S. Mitchell, M. F. Goldfaden, and G. J. Hadro; Effect of Added Iodine on the Enzymes of Milk and on Other Enzymes, by M. Glickstein, W. S. Mueller, and J. H. Frandsen; Added Iodine in Milk and Fecal Bacteria, by J. E. Fuller and W. B. Esselen, Jr.; and Iodine and Bacterial Counts in Milk, by J. E. Fuller, G. S. Congdon, and M. Glickstein. The introduction is by J. E. Fuller.

Growth and chemical composition of the human skeleton, W. W. SWANSON and V. IOB (*Amer. Jour. Diseases Children*, 59 (1940), No. 1, pp. 107-111, fig. 1).—The proportion of bone and cartilage is reported for five fetal skeletons varying in weight from 530 to 4,070 gm. and representing fetal ages from 4.1 to 10.0 lunar mo. In this time the skeletal weight changed from 12 to 9.8 percent of the weight of the body; the cartilage decreased from 42.5 to 36.1 percent of the total skeletal weight, while the bony skeleton increased from 57.5 to 63.9 percent of this weight. Three of the skeletons, at fetal ages of 4.1, 9.1, and 10.0 lunar mo., respectively, were analyzed for moisture, fat (except at 4.1 mo.), sodium, potassium, chlorine, phosphorus, calcium, and magnesium, the value being reported separately for bones and cartilage; at 4.1 mo., the spine was analyzed separately. The molecular equivalent of sodium in both bone and cartilage was from 2 to 6 times the molecular equivalent of chlorine, indicating that the greater part of the sodium, particularly in bone, was in the inorganic salts of the matrix.

The retention of calcium and phosphorus by pre-school children, H. B. PIERCE, R. G. DAGGS, A. B. MEESEVEY, and W. J. SIMCOX. (Univ. Vt.). (*Jour. Nutr.*, 19 (1940), No. 4, pp. 401-414, fig. 1).—This study was planned to compare milk and a wheat farina fortified with an alkaline salt mixture (apparently disodium and tricalcium phosphates) as sources of calcium and phosphorus for preschool children. The subjects, four girls and six boys from 3 to 6 yr. of age, were divided into two groups of three boys and two girls each and matched as evenly as possible with regard to weight and age. An adequate basal diet was used, the diet being so planned that approximately 50 mg. of calcium per kilogram of body weight per day, or 80 percent of the total ingested calcium, was supplied by milk. To eliminate the effects of any previous calcium depletion, the basal diet supplemented with calcium lactate in the one group and with calcium phosphate in the other was fed for a preliminary period of 6 weeks. The experimental periods (5 weeks) were then begun; during this time the one group received the basal diet only, while the other group received the basal diet modified so that 200 mg. of milk calcium were replaced by 200 mg. of calcium in the fortified cereal. After an intermediary period of 2 weeks in which the calcium was reduced to approximately two-thirds that of the basal diet, the experiment was repeated with reversal of the groups in regard to dietary treatment. The data on calcium and phosphorus metabolism during the five periods are presented and discussed.

The results showed that retentions in the first two periods were higher than in the other three, probably because of previous depletion. During the test period the utilization of calcium and phosphorus, as measured by retention, was equally good from milk or from the cereal fortified with tricalcium phosphate. The children were in positive calcium, phosphorus, and nitrogen balance throughout the study, and more phosphorus was stored than was required to convert retained calcium to bone. The averages of calcium and of phosphorus retention over the 6-mo. period were in close agreement for the two groups, 11-12 mg. of calcium and 7-8 mg. of phosphorus per kilogram of body weight being stored daily. About 19 percent of the calcium and 11 percent of the phosphorus were retained. For maximal retention of calcium it was necessary with the basal diet used to have a daily intake of over 700 mg. of calcium. It is pointed out that this is greater than the amount suggested by Outhouse et al. (*E. S. R.*, 82, p. 132), but that the severity and length of winter with the limitation of sunshine might have necessitated more calcium than would be required for the same retentions in more moderate climates. The growth rates of the children were very satisfactory.

Studies in calcium metabolism with the aid of its induced radioactive isotope, I, W. W. CAMPBELL and D. M. GREENBERG. (Univ. Calif.). (*Natl. Acad. Sci. Proc.*, 26 (1940), No. 3, pp. 176-180, fig. 1).—Radioactive Ca^{45} with a half

life of 180 days was shown to be suitable for use as a "tracer" element when radioactivity is measured with a screen-wall counter tube. This element prepared, by a procedure noted briefly, as the lactate in 5 percent solution, was administered by stomach tube in a 5-cc. portion to a fasting rat weighing 259 gm. The animal, then placed within a metabolism cage, was given food after 18 hr. and was sacrificed after 69 hr. The blood was withdrawn by cardiac puncture, the organs were dissected out, and the tissues separated. Each of these, as well as the urine and the feces, was ashed preliminary to separation of calcium as the oxalate. Radioactivity measurements on each of these precipitates and the precipitate from the standard (0.0976 cc. of the original calcium lactate solution) were made on the screen-wall counter.

The sum of the measured activities of the excreta and all of the tissues showed a recovery of 103 percent of the Ca^{45} given. Data (corrected by the factor 100/103), presented to show the distribution of the radioactive calcium, indicate that 89.2 percent of the Ca^{45} administered by stomach tube was absorbed and that 65.6 percent of the amount given was excreted in the urine, 57.9 percent appearing during the first 9 hr. after administration. The unexcreted Ca^{45} (23.6 percent) was distributed in various tissues, the largest amount occurring in bone, with significant amounts in skin and teeth. Specific retentions (percentage of total dose per gram of fresh weight) "fell off in the following order: Highest in bone and teeth, which were about equal; intermediate in small intestine, large intestine, heart, lung, and skin; and least in the remaining tissues."

Iron metabolism.—I, The role of calcium in iron assimilation, S. W. KLETZKEN (*Jour. Nutr.*, 19 (1940), No. 2, pp. 187-197).—Young rats were fed a milk diet productive of severe anemia and a number of the animals were sacrificed as anemic controls at this stage. Others were transferred to a basic control ration providing a daily intake of 0.5 mg. of iron and 0.02 mg. of copper per animal or to the basic ration variously supplemented with calcium salts. After 5-6 weeks of controlled feeding, the animals were sacrificed and analyzed to determine the iron content of liver, spleen, blood, and carcass in order to follow the effect of variation in the supply of calcium on the amount of iron accumulated in organs and body. It was found that the addition of 1 percent of CaCO_3 to the basic ration reduced the iron content of all tissues except the spleen, the average liver, blood, and carcass values being 57, 86, and 90 percent of the respective values for the control group on the basic ration; at a 3 percent level of CaCO_3 these values were reduced to 28, 72, and 61 percent of the values for the control group; with calcium lactate in an amount equivalent to a 2.5 percent level of CaCO_3 the reduction was still greater, the liver, blood, and carcass values being only 25, 42, and 45 percent of the respective control values. CaCl_2 , $\text{Ca}_3(\text{PO}_4)_2$, and CaSO_4 in amounts equivalent to 3 percent of CaCO_3 had, with the exception of the sulfate, a similar adverse effect on the iron retention.

The addition of 1 and 3 percent CaCO_3 to a basal diet containing 90 percent of ground whole wheat likewise resulted in lower tissue iron values. It is suggested that these disturbances, caused by the introduction of the readily ionizable or metabolizable calcium salts into the intestinal tract, may be referable to the ionic imbalance produced; "that adsorption is a factor in making iron unavailable is not disproved; neither are changes in intestinal pH or the removal of iron by precipitation." The possible bearing of these findings on the metabolism of other minor elements is discussed.

Iron utilization in dogs on milk diets, D. V. FROST, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Nutr.*, 19 (1940), No. 4, pp. 311-320, fig. 1).—Young dogs made anemic (hemoglobin 3.5-6.0 gm. per 100 cc. of blood)

on whole milk were then given daily either 10 mg. of iron as ferric chloride alone or 10 mg. of iron plus 2 mg. of copper as copper sulfate. In the former group the animals responded by increases of hemoglobin to a level of 8-10 gm. per 100 cc. of blood during the first week or two of therapy, during which time about 80-90 percent of the ingested iron was utilized for hemoglobin formation. At the end of this period the hemoglobin level ceased to increase rapidly, and practically none of the ingested iron was returned as blood hemoglobin. Administration at this point of 2 mg. of copper per day along with the iron, produced another rapid resumption of hemoglobin formation until normal levels were reached again. The first plateau in the hemoglobin curve was considered as evidence that a copper deficiency had developed.

Dogs receiving the copper supplement, together with the iron, from the beginning of the experiment showed more rapid increases in the blood hemoglobin levels during the first weeks of the experiment and more rapid weight gains than the first set of experimental animals. Although calculated iron utilization approximated 100 percent during the first weeks of therapy with iron and copper, the percentage of utilization decreased rapidly thereafter, and after 6-8 weeks only 60-70 percent of the total iron ingested could be accounted for.

Some of the iron was apparently "stored" as demonstrated in succeeding experiments in which the animals, after a period of iron therapy with resulting hemoglobin formation, had their hemoglobin stores reduced by bleeding and the iron supplement withdrawn at the same time. During this latter period there was some hemoglobin formation, apparently drawing upon iron stored during the period of therapy. When the preliminary period of iron administration did not include simultaneous administration of copper, the copper stores were depleted and the hemoglobin regeneration in the succeeding period was slight; this is interpreted to indicate that stored iron becomes available for hemoglobin formation only in the presence of adequate copper. Experiments with one dog on a milk diet indicated that cobalt acted as an adjunct to copper and iron for maximal hematopoiesis.

Studies in mineral metabolism with the aid of induced radioactive isotopes.—IV, Manganese, D. M. GREENBERG and W. W. CAMPBELL. (Univ. Calif.). (*Natl. Acad. Sci. Proc.*, 26 (1940), No. 7, pp. 448-452).—Continuing this series (*E. S. R.*, 84, p. 137), radioactive manganese (Mn^{55}) with a half life of 310 days was prepared by the bombardment of Fe^{56} with deuterons, and separated by a procedure outlined, being then administered in metabolic tests on each of two rats weighing about 160 gm. and maintained on a normal diet; 1-cc. doses of the labeled $MnCl_2$ (1 mg. Mn) were given, by stomach tube in one case and by intraperitoneal injection in the other. The animals were sacrificed 75.5 hr. after administration of the doses. The various tissues separated at this time, as well as feces and urine obtained separately at desired intervals, were dried and ashed, 1 mg. of inactive Mn as the sulfate being added to each ashed sample as a carrier for the radioactive Mn. Data presented on the distribution of the labeled Mn (which was recovered to the extent of 96 and 78 percent in the two cases, respectively) showed that over 90 percent is excreted within 75 hr. when administered either by stomach tube or by intraperitoneal injection, that very little, if any, of the absorbed Mn is excreted in the urine, and that liver, bone, and muscle take up appreciable quantities of the absorbed Mn, although other organs may take up varying amounts due to storage or to processes of excretion.

Dietary and metabolic studies of Eskimo children with and without dental caries, including studies of the metabolic balances of calcium, phosphorus, and nitrogen, E. H. SIEGEL, L. M. WAUGH, and M. KARSHAN (*Amer.*

Jour. Diseases Children, 59 (1940), No. 1, pp. 19-38).—Calcium, phosphorus, and nitrogen balance studies over 2- to 4-day experimental periods were carried out on a total of 23 Eskimo children in 3 isolated native communities, Kepnuk, Hooper Bay, and the Moravian orphanage, in the Kuskokwim region of Alaska. Twelve of the children, ranging in age from 8.5 to 15 yr., were caries-free, while the other 11, from 7 to 15 yr. of age, had active (3 cases) or inactive caries. The results indicated that the 3 children with active caries had retentions that fell within the ranges of the caries-free group or those with inactive caries. Retentions were fairly uniform for the children in any one community but differed markedly between communities. There were high positive balances of both calcium and phosphorus at Hooper Bay, where the diet was high in these elements and potentially acid; there were large negative balances of both calcium and phosphorus at Kepnuk, where the diet was very high in both elements but potentially basic; and low positive to slight negative balances of the two elements at the orphanage, where the diet was low in calcium, moderately high in phosphorus, and potentially acid. Despite these differences in diets and in the retentions of the subjects studied over the brief periods, most of the natives in the areas studied were found to be caries-free. It is considered that the data reported give no basis for the view that the freedom from dental caries enjoyed by a primitive people is due to a nutritional superiority of "natural" as compared with "civilized" diets.

Biochemical studies of the saliva of Eskimos correlated with dental caries and the occurrence of salivary calculus, M. KARSHAN, E. H. SIEGEL, and L. M. WAUGH (*Amer. Jour. Diseases Children*, 59 (1940), No. 1, pp. 39-44).—In a study of stimulated and unstimulated saliva of Kuskokwim Eskimos (19 and 12 caries-free subjects, and 10 and 11 with caries, in the 2 groups, respectively) the mean values for total calcium, inorganic phosphate, and carbon dioxide capacity were found higher for the caries-free group than for the group with caries (including only 3 with active decay); similarly the mean values were somewhat lower in a calculus-free group than in a group with varying amounts of calculus. It is considered that there was no correlation between the carbon dioxide capacity of the saliva and the acid-base balance of the diet.

The diet of adolescent girls, with special reference to nutritional state and dental caries, L. M. BAYNE. (Univ. Calif.). (*Jour. Ped.*, 16 (1940), No. 1, pp. 56-68, figs. 6).—This report is based on data collected in a group of 80 normal urban (Oakland, Calif.) public school girls of the "middle" socioeconomic class during 1932, 1934, and 1935. Analysis of the dietary showed the diets to be generally poor, with the greatest deficiency in vegetables, fruits, milk, and whole cereals, and with a corresponding excess of starches and sweets. Clinical investigation showed that about one-half of the girls were of optimum weight, the other half being about equally divided between underweight and overweight. The girls with optimum weight showed diets slightly superior to those of the other group. Dental caries was evaluated by making counts of decayed, missing, and filled permanent teeth as they appeared at semiannual medical inspection. The count of diseased teeth rose from an average of two at 11.5 yr. of age to an average of nine at 17.5 yr. of age. No statistical relationships between poor teeth and poor diet could be demonstrated, however, probably because no diets were good enough to exert a consistent protective influence.

Inhibition of experimental dental caries by fluorine in the absence of saliva, V. D. CHEYNE (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 1, pp. 58-61).—Beginning at 31 days of age, 76 rats received a caries-producing diet;

of these animals, 32 had had the salivary glands removed at 22 days of age; of the desalivated animals, 12 received daily an oral aqueous dosage of 3 mg. of fluorine as potassium fluoride. At the end of 200 days the animals were sacrificed, the jaws were separated, and all molar teeth were examined under magnification (30X) for simple fractures and carious cavities. On the caries-producing diet the normal animals were found to have an average of 9.1 cuspal involvements and 3.5 carious teeth per animal; those with the salivary glands extirpated had 40.0 and 10.5, respectively; while the desalivated rats receiving the 3 mg. of fluorine per day averaged only 6.0 cuspal involvements and 2.3 carious teeth per animal. These results indicate that the beneficial effect of the fluorine is greater than that of the saliva acting independently; that fluorine has an inhibiting effect even when oral secretions are at a minimum; and that fluorine does not prevent initial fracture of the teeth but does prevent subsequent progressive destruction, apparently by action on the tooth or in the region where food and bacteria come in contact with the tooth surface.

Oslo meals for school children (*Med. Off.*, 63 (1940), No. 11, pp. 95, 96).—The greater beneficial effects to school children of cold lunches of the Oslo type, consisting practically entirely of protective foods, than of a hot meal of meat and pudding is brought out through brief reports of comparisons of the gains in weight of groups of children in Oslo following 6 weeks' supplementary feeding of the two types of meal and of the percentage gains of height and weight of similar groups of children in London during a 10-week period. The Oslo breakfast as practiced in Norway consists of $\frac{1}{2}$ l. of unskimmed milk, crackers, and bread prepared with whole meal flour, with margarine and goat-milk cheese, and half an orange, half an apple, or 1 raw carrot. In the modified Oslo meal, as served in the London experiment, whole meal bread was substituted for the crackers, New Zealand butter for the margarine, and bland cheese for the goat-milk cheese. In both studies the gains were much greater for the children receiving the Oslo type meal.

Vitamins—their respective sources, their physiological values, C. A. ELVEHJEM. (*Univ. Wis.*). (*Bakers Digest*, 14 (1940), No. 10, pp. 183-186).—An address.

Vitamin A: Methods of assay and occurrence in foods, B. W. FAIRBANKS. (*Univ. Ill.*). (*North Amer. Vet.*, 21 (1940), No. 3, pp. 165-167).—A review considering very briefly the chemistry of vitamin A and carotene, methods of assay, units of vitamin A, occurrence in foods, and stability of the vitamin.

Dark adaptation and vitamin A deficiency: A new technic, A. G. SHEPHERD. (*Amer. Jour. Clin. Pathol.*, 10 (1940), No. 2, pp. 168-175, figs. 3).—The apparatus illustrated consists of a standard size X-ray viewing box (16 by 19 in.) of frosted white glass fitted into a white cardboard or wooden box and equipped with a 250-w. bulb. As a means of control of the bleaching process of the visual purple, the subject is required to read aloud the letters stenciled on thin white paper pasted in the center of the frosted glass, thus assuring direct gaze at the bright light. The degree of dark adaptation is measured by the intensity of light passing through a solution of prussian blue in a colorimeter cup so arranged, with syringe attachment, as to permit of decrease or increase in depth of the liquid column, thus modifying the intensity of light. The colorimeter is placed in the middle of the box about $\frac{1}{2}$ in. from the border. The subject is seated close to the apparatus with the forehead touching the upper part of the box two fingerbreadths above the eyebrows. After a 2-min. period of bleaching, the colorimeter light is turned on and the bright light extinguished. The rapidity of regeneration of the visual purple is first measured at the periphery of the eye by requiring the subject to signal upon perception of the colorimeter light coming through

a 10-mm. column of the liquid, while looking at a notch in the left side of the box 7 in. from the base and in which the thumb rests. This gives a rating at an angle of about 35°. The gaze is then transferred to the colorimeter and the subject signals when the light again appears, thus giving a separate measurement of foveal regeneration time. Two min. after disappearance of the bright light and at 2-min. intervals for a period of 8 min. the subject finds his light threshold by adjusting the depth of the liquid, thus modifying the light intensity. This adjustment by the subject rather than the operator permits of more exact readings. For 8 normal controls peripheral and foveal regeneration times averaged 15-25 and 40-70 sec., respectively. The light threshold, expressed as millimeters of the column of prussian blue after 2, 4, 6, and 8 min. was 11-12.5 mm., 12-14, 15-17, and 16.5-18.5 mm., respectively.

Some basic principles of dark adaptation, R. McDONALD (*Arch. Ophthalmol.*, 23 (1940), No. 4, pp. 841-851, figs. 6).—The problem of dark adaptation and its clinical significance is discussed with reference to the contributions of the past few years to the physiology of rod and cone vision and the chemical basis of vision. Commenting on the use of dark adaptation as a test for vitamin A deficiency, the author states that "many suggestions have been devised to simplify and hasten the procedure. It must be remembered, however, that dark adaptation is a physiologic phenomenon that requires time and that there are probably other factors concerned with dark adaptation besides the regeneration of visual purple. Apart from the subjective difficulties of the test, the exact metabolism of vitamin A in the body or the individual daily requirements are not yet known for certain. Theories do not always fit the facts, and the value of dark adaptation as a routine test of vitamin A deficiency can be established only by a critical analysis of the results obtained. Unfortunately, in one's enthusiasm the basic physiology is sometimes neglected, and a true appreciation of the significant changes is missed."

Effect of fertilizing treatment on vitamin A content of sweet-potatoes, P. SWANSON, G. STEVENSON, E. S. HABER, and P. M. NELSON. (*Iowa Expt. Sta.*). (*Food Res.*, 5 (1940), No. 4, pp. 431-438).—The vitamin A content of sweet-potatoes of the Prolific variety was determined as 25.3 International Units or 56 Sherman-Munsell units per gram. Five lots were used, grown, respectively, in Buckner sand (deficient in N, P, K, and organic matter) without fertilizer, and with fertilizing treatments supplying muriate of potash, manure, nitrate of soda, or superphosphate. The concentration of vitamin A in the five lots ranged from 22 to 28 I. U. on the basis of an 8-week test (from 20 to 26 I. U. in a 5-week test), and apparently was not significantly affected by the fertilizer.

The vitamin was estimated by the method of Swanson et al. (*E. S. R.*, 80, p. 277), the carotene used as standard being that supplied as a provisional standard material by the League of Nations. The average weight gains made by the lots of rats fed the sweetpotatoes are reported, together with standard deviations.

Effect of storage on vitamin A content of canned tomatoes, P. P. SWANSON, G. STEVENSON, and P. M. NELSON. (*Iowa Expt. Sta.*). (*Jour. Home Econ.*, 32 (1940), No. 4, pp. 246-251).—Tomatoes of the Marglobe variety, grown during the summers of 1930-34, inclusive, in the same garden and canned in tin containers for use in this experiment by a commercial canning company, were stored upon delivery at the laboratory for periods of 6, 18, 30, or 42 mo. Samples representing the different periods of storage, as well as fresh tomatoes grown under similar conditions, were assayed by a method previously outlined (*E. S. R.*, 80, p. 277). The tomatoes, preparatory to feeding, were sieved to give assay samples in which the vitamin A was uniformly distributed, diluted to volume, and fed as appropriate supplements. Except for the samples 42 mo. old, the

supplements were fed at more than one level. From 1933 to the termination of the experiment, carotene was fed at different levels to groups of rats carefully matched against those receiving the tomato supplements, and the response of the carotene-fed animals was used in establishing curves of reference from which to evaluate the results with the uncontrolled test animals. The carotene used was from samples supplied as provisional standard material by the League of Nations. The equations used for interpreting the bio-assays in terms of International Units are given; in addition the assays were interpreted to express the concentration of the vitamin A in the fruit in terms of Sherman-Munsell units.

The results, discussed in some detail with particular reference to methodology, indicated that the average concentration of vitamin A in canned Marglobe tomatoes was 5.7 I. U. (12.0 Sherman units) per gram. Fresh tomatoes of the same variety and grown under similar conditions averaged only 3.3 I. U. per gram. Storage of the canned tomatoes at room temperature for as long as 42 mo. did not change the vitamin A value of the tomatoes.

Histological demonstration of vitamin A in rats by means of fluorescence microscopy. H. POPPER (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 1, pp. 133-136, fig. 1).—Earlier observations by Peacock (*E. S. R.*, 56, p. 110), Von Querner (*E. S. R.*, 76, p. 276), and others that vitamin A shows a green fluorescence in ultraviolet light which disappears rapidly during irradiation were confirmed by observations under the fluorescence microscope of thin pieces of rat tissue fixed in excess of 10 percent formalin and frozen and by staining sections with fluorescent dyes. The tissues tested were obtained from 23 rats, including 8 positive controls, 7 deficient in vitamin A, and 8 treated with different quantities of vitamin A after preliminary depletion. The vitamin A content was determined biologically by the U. S. P. XI method and checked chemically. In the positive controls and in the deficient animals after repletion, green fluorescence fading to blue was noted in droplets in the parenchyma of the liver, in the cytoplasm, in the Kupffer cells, and in the adrenals. In the deficient rats and in those which had been given vitamin A therapy only a few hours before killing, the green fluorescence was absent. In 6 newborn rats there was no green fluorescence in the cytoplasm of the liver and only a few fluorescent droplets in epithelial and Kupffer cells, and there was likewise no green fluorescence in the adrenals. In a limited number of rats deficient in vitamins B₁, B₂, and D, normal amounts of fluorescent materials were found in the liver and adrenal. The livers of several other species gave essentially the same findings as the liver of normal rats.

Histological demonstration of vitamin A in the human liver by means of fluorescence microscopy. H. POPPER (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 2, pp. 234-236).—Using the same technic as in the rat study noted above, the author has examined on autopsy 113 human livers. In agreement with chemical determinations of the vitamin A content of human livers by Moore (*E. S. R.*, 81, p. 451) and others, a great variation was found in the amount and distribution of the green fluorescing bodies. The Kupffer cells usually showed small fluorescing droplets which gave a silver-gray fluorescence after staining with phosphine 3 R but not after acetone treatment. In cases of infectious diseases there was usually a great increase in the number of green fluorescing Kupffer cells and in starvation and acute hepatitis a decrease. Green fading fluorescence was also shown in epithelial cells and varied in distribution under different conditions. The livers of newborn or premature infants showed little of this fluorescence. "The histological picture suggests that vitamin A is transmitted from the Kupffer cells to the epithelial cells and disappears from the latter only after reduced nutrition. Sometimes the trans-

mission to the epithelial cells is impaired with consequent retention in the Kupffer cells."

In addition the characteristic green fluorescence was found in the epithelial cells of the fascicular and glomerular layer of the adrenals, with amounts running parallel with that of the liver, in the cells of the corpus luteum of the ovary and the tubular and Leydig cells of the testes, and in small but varying amounts in the fat cells in different organs and in fat tissue. No fluorescence was shown by the normal kidney, but it was found in two cases of nephritis.

The relationship between biophotometer tests and the vitamin A content of the blood of children, W. S. BAUM and A. B. MCCOOMB (*Jour. Ped.*, 16 (1940), No. 4, pp. 409-418, fig. 1).—Ninety-eight children were tested once with the biophotometer, all readings being performed by the same operator on a Frober-Faybor instrument in a completely darkened room. Readings were taken (1) upon entering the darkroom, (2) after a 10-min. period in the dark, (3) 20 sec. after a 3-min. exposure to bright light, and (4, 5, 6, and 7) after 2½, 5, 7½, and 10 min. in the dark. The vitamin A, carotene, and xanthophyll contents of the blood were determined in all subjects.

As judged by the Frober-Faybor standards in which the (3) reading is considered the most significant, 33 of the subjects showed normal dark adaptation, 64 were intermediate, and 1 showed subnormal adaptation. When regrouped by the standards of Jeans (*E. S. R.*, 77, p. 886), who used the same type of instrument and based his standards on the postbleaching reading (3) and the final reading (7), 32 subjects were in the normal group, 47 in the intermediate, and 19 subnormal, a distribution which corresponded with that obtained by Jeans. Dietary history, obtained from 70 of the subjects, showed no correlation with the biophotometer readings, nor was a history of symptoms of vitamin A deficiency elicited in any case. Correlation was absent between all readings of the biophotometer and the vitamin A, carotene, and xanthophyll content of the blood.

In a second series of 19 patients, each subject was tested repeatedly with the biophotometer until no further improvement in readings was evident. From 8 to 10 testings were necessary to accomplish this. The vitamin A content of the blood was then determined. The improvement in biophotometer readings after repeated testing resulted in a decrease in the number of subnormal readings in the trained subjects so that only about 10 percent came in the subnormal group. This decrease indicated the importance of the training factor, and it is considered, therefore, that a single reading of the biophotometer is of no importance in estimating vitamin A deficiency. Even in this trained group no statistically significant correlation was found between the blood vitamin A values and the postbleaching biophotometer readings (3) used for the grouping by the Frober-Faybor standards; neither was there any correlation when the subjects were regrouped according to the Jeans standards. In the latter grouping the normal subjects (9) averaged 17.2 vitamin A units per 100 cc. of blood, the intermediate group (8) averaged 12.6, and the subnormal group (2) 16.7 units per 100 cc. Vitamin A absorption tests were performed on 10 subjects, but the results were too few to permit conclusions.

Cutaneous manifestations of vitamin A deficiency in children, E. LEHMAN and H. G. RAPAPORT (*Jour. Amer. Med. Assoc.*, 114 (1940), No. 5, pp. 386-393, figs. 7).—A general discussion under the headings of clinical manifestations, photometric studies, treatment and course, occurrence in childhood, etiology, etiology of keratosis pilaris (lichen pilaris, ichthyosis follicularis), human requirements for vitamin A, and incidence of vitamin A deficiency in America, with numerous references to the literature, serves as a background for the

authors' observations over a period of 8 mo. on nine children, almost all of families on relief, attending an outpatient department of a New York City hospital. The clinical diagnosis of cutaneous lesions of vitamin A deficiency in these children was confirmed by biophotometer readings, all of which were definitely within the subnormal zone. The test was repeated several times before vitamin A therapy was begun, and as an additional corroboration in some cases the response after 1 or 2 hr. to 200,000 International Units of vitamin A by mouth was tested, with results indicating for the most part a rise from the deficient to the borderline or normal zone. Subsequent treatment with from 100,000 to 300,000 I. U. of vitamin A daily in the form of percomorph oil in addition to the vitamin A of the diet, estimated to furnish from 1,500 to 5,000 I. U. of vitamin A, resulted in improvement in the visual tests and in clinical symptoms. In some cases the response was rapid, and in others prolonged intensified treatment was required. Maximal improvement of the skin was reached in from 2 to 4 mo.

The authors conclude that "the typical follicular papules described by Frazier and Hu [E. S. R., 67, p. 482] and others are not an infrequent cutaneous manifestation of vitamin A deficiency during childhood. So far our investigations indicate that keratosis pilaris, lichen pilaris, lichen spinulosus, ichthyosis follicularis, and other synonyms are merely descriptive terms for the cutaneous manifestations of vitamin A deficiency."

Stomach lesions in rats kept on diets deficient in vitamin A. L. S. FREDERICIA, S. GUDJONSSON, B. VIMTEUP, and S. and J. CLEMMESSEN (*Amer. Jour. Cancer*, 39 (1940), No. 1, pp. 61-69).—The possible relation of lack of vitamin A as a causative factor for stomach lesions in the rat was considered in four series of experiments in which 114 rats were given for varying periods of time up to 52 weeks a diet deficient in vitamin A either intermittently or continuously and 74 rats were kept on a normal diet as a control. Proliferative changes in the mucosal lining of the stomach were found in 80 percent of all the experimental rats and in only 18 percent of the controls. Histological changes suggestive of malignancy were observed in the stomach of 1 experimental and 1 control rat. The length of time during which the rats were kept on the deficient diet was the most important factor in determining the development of changes in the stomach. The incidence of papillomatosis was by far the greatest in the animals particularly resistant to vitamin A deficiency.

In a fifth experiment 41 young rats were put on alternating A-deficient and normal diets for 18 days and then subjected to laparotomy for inspection of the outside of the stomach. In 27 cases thickening of the stomach wall was visible, and in 11 tumors were found projecting from the surface. When the animals in this group were put back on a normal diet, only 2 of 21 surviving at the end of a year showed lesions on autopsy.

It is concluded that vitamin A deficiency must have been a determining factor in the production of the stomach changes, although other factors as yet unknown may have played an important part.

White flour and vitamins. C. H. BAILEY. (Univ. Minn.). (*Northwest. Miller*, 202 (1940), No. 5, pp. 23-25).—This paper, delivered as an address, is concerned particularly with vitamin B₁. Reference is made to its functions, the matter of units and requirements, and the distribution in foods—in wheat and wheat milling products particularly. It is pointed out that straight flours (71 percent yield) contain about one-seventh and wheat germ about one-sixth of the vitamin in the whole grain, leaving about 70 percent of the vitamin B₁ in other streams of flour.

If the vitamin B₁ content of bread is to be increased there are several methods possible: (1) The use of a low-grade flour, or of a patent flour reinforced with

wheat germ, (2) the addition of crystalline thiamin, (3) addition of vitamin concentrates, and (4) use of high vitamin yeasts. The first of these methods would most likely be managed at the mill. There are a number of difficulties, however, one being the poor storage quality of such flours, another the high ash content and resulting lower acceptability to the baker, and third, the limitation to the amount of available germ. It would require, for example, about 13½ parts of germ (10 International Units per gram) and 86½ parts of patent flour (0.8 I. U. per gram) to result in a mixture assaying 1.6 I. U. per gram (the average for the whole wheat grain). This amount of germ is about 15 times the amount commercially recoverable in milling the given amount of flour.

The other three methods of fortification would probably be handled at the bakery. They would involve an added direct cost for materials which would not include the cost of mechanical operations, wastage, or assaying. Because of these difficulties the millers and bakers are cautioned not to embark upon any extensive "reinforcing" programs until consumer reactions and preferences in the matters of price increase and change in bread type have been carefully tested.

Vitamin B₁ and vitamin B₂ (G) content of vegetables as influenced by quick-freezing and canning, C. R. FELLERS, W. B. ESSELEN, JR., and G. A. FITZGERALD. (Mass. Expt. Sta. et al.). (*Food Res.*, 5 (1940), No. 5, pp. 495-502).—Asparagus (Martha Washington variety), lima beans (Henderson Bush), and spinach (Virginia Savoy) grown at Bridgeton, N. Y., and peas (Thomas Laxton) grown at Corinna, Me., were harvested at 10-day intervals, portions of each lot being quick-frozen by the Birds Eye method or canned by commercial process. The fresh, frozen, and canned vegetables, shipped to Amherst, Mass., were assayed biologically for their content of vitamins B₁ and B₂, the samples during the period of shipment and use being held under suitable storage conditions.

For the canned vegetables separate assays were made for the solid portion and the juice. "Fresh asparagus, peas, lima beans, and spinach were found to contain 65, 133, 67, and 36 International Units of vitamin B₁ and 53, 70, 122, and 145 Bourquin-Sherman units of vitamin B₂ (G) per 100 gm., respectively. Asparagus, peas, lima beans, and spinach retained 78, 97, 48, and 94 percent of their vitamin B₁, and 95, 100, 84, and 91 percent of their vitamin B₂ (G), respectively, when quick-frozen; and 72, 60, 28, and 71 percent of their vitamin B₁, and 98, 100, 70, and 45 percent of their vitamin B₂ (G) content, respectively, when canned." It is pointed out that the order of loss of the vitamin B₁ and B₂ content of quick-frozen and canned vegetables appears to vary with the length of the blanching period. "Because of the solubility of these vitamins in water, minimum blanching periods consistent with the requirements are recommended."

Properties of the filtrate factor of the vitamin B₂ complex, with evidence for its multiple nature, A. MOHAMMAD, O. H. and G. A. EMERSON, and H. M. EVANS. (Univ. Calif.). (*Jour. Biol. Chem.*, 133 (1940), No. 1, pp. 17-28).—In this study, noted earlier from a preliminary report (E. S. R., 82, p. 230), procedures are described for the concentration of the rat filtrate factor complex obtained as preparations from cane molasses, an aqueous rice bran extract, and an alcohol-soluble liver preparation. Filtrate factor activity was judged by the growth of female rats maintained on a filtrate factor-deficient basic diet and supplied with thiamin, riboflavin, and vitamin B₂. The complex was found to be extractable with isoamyl alcohol, soluble in methanol, ethanol, and acetone, and adsorbable on norite from acid solution. The complex lost only part of its activity on heating with 1 N NaOH at 100° C., could be distilled at high vacuum (10⁻⁵ mm. Hg) at 100°, the resulting compound failing to form a benzylthiuronium salt. The complex also failed to form a Cu salt and was

not precipitated by semicarbazide hydrochloride or benzoyl chloride. "Two factors at least appear to be a part of the filtrate complex; one is essential for normal growth, the other preserves normal color in the pelage. While both factors are extractable with diethyl ether from acid solutions, the residue, while promoting growth, does not contain the antigraying factor. Cane molasses, an aqueous rice bran extract, and an alcohol-soluble liver preparation appear to be good sources of both factors, but brewers' yeast, while a rich source of the growth factor, is low in the antigraying factor; whole milk powder is low in its content of both factors."

Identity of natural and synthetic crystalline vitamin B₁₂, E. J. REIDMAN, W. L. SAMPSON, and K. UNNA (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 1, pp. 112-115, fig. 1).—A single dose curative method and a prophylactic method, both of which are described in detail, were used in this comparison of the biological activity for rats of natural and synthetic vitamin B₁₂. In both tests the natural and synthetic vitamins proved to be identical in their activity. A single dose of 100 γ cured 100 percent, of 50 γ 70-80 percent, and of 25 γ only 3 out of 25 of the test animals within 14 days. Gains in weight were proportional to the dosage. In the prophylactic tests 10 γ per rat per day was sufficient to promote growth at a practically normal rate. No increase in rate of growth was secured with 12.5 γ and 25 γ a day.

Urinary excretion of vitamin B₁₂ in the rat, J. V. SCUDI, H. F. KOONES, and J. C. KERESZTESY (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 1, pp. 118-122).—A colorimetric procedure for the determination of vitamin B₁₂ based upon a modification of the Gibbs reaction, is described briefly, and the results are reported of its use in studying the urinary excretion of vitamin B₁₂ in rats.

In comparable tests in which the vitamin was administered intravenously, intraperitoneally, and orally, the quantities of the vitamin recovered were essentially the same, suggesting complete absorption of the vitamin. The percentage output was approximately the same on low as on high doses, and the same in 5 hr. as in 24 hr., thus showing rapid excretion. At high dose levels (10 mg. per kilogram and above) deficient and normal rats excreted essentially the same percentages of the administered vitamin. At low levels (2 mg. per kilogram) normal rats appeared to excrete a higher percentage of the ingested vitamin than B₁₂-deficient rats. It is suggested that at this low level a differentiation of normal and deficient urinary output should be possible in larger animals.

Antidermatitic effect of vitamin B₁₂ analogues, K. UNNA (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 1, pp. 122-124).—With the use of the single dose curative method, data were obtained on the vitamin B₁₂ activity of 10 synthetic derivatives of 2-methyl pyridine closely related to the vitamin and summarized as follows:

"Acetylation does not diminish the antidermatitic effect of vitamin B₁₂. Methylation or ethylation of one of the hydroxymethyl groups diminishes the vitamin activity considerably but less than the methylation of the phenolic hydroxyl group. Replacement of one or more hydroxymethyl groups by methyl or amino groups destroys the vitamin activity."

Negative effect of synthetic vitamin B₁₂ hydrochloride in nutritional deficiency in man, K. KARK, E. L. LOZNER, and A. P. MEKLEJOHN (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 1, pp. 97-99).—Contrary to the curative effects of vitamin B₁₂, reported by Spies et al. (*E. S. R.*, 83, p. 281) for certain symptoms continuing in pellagra patients after treatment with nicotinic acid, riboflavin, and thiamin chloride and by Fouts et al. (*E. S. R.*, 80, p. 711) for microcytic anemia developing in puppies on a synthetic diet deficient in vitamin B₁₂,

observations are reported showing the ineffectiveness of synthetic vitamin B₆ hydrochloride in the treatment of six patients with clinical diagnoses of alcoholic pellagra (2), endemic pellagra (2), idiopathic hypochromic anemia, and nutritional macrocytic anemia. Four of the patients received ferrous sulfate, nicotinic acid, thiamin chloride, riboflavin, and ascorbic acid previous to and during vitamin B₆ therapy. In none of the cases was there any improvement either in hematological findings or subjective symptoms and objective signs following vitamin B₆ administration.

Toxicity of vitamin B₆. K. UNNA and W. ANTOFOL (*Soc. Egypt. Biol. and Med. Proc.*, 48 (1940), No. 1, pp. 116-118).—In experiments with rats, dogs, and monkeys synthetic vitamin B₆ was shown to have very low toxicity, resembling in this respect thiamin, riboflavin, and nicotinic acid. In rats, doses up to 1 gm. per kilogram were well tolerated and only excessively large doses, 3.1 gm. per kilogram for the free base and 3.7 gm. per kilogram for the hydrochloride, were lethal. Differences were small between the toxicity by subcutaneous and oral administration, showing that the vitamin is absorbed rapidly and completely from the intestinal tract. There was no cumulative effect on prolonged feeding of sublethal doses.

Nicotinic acid potency of food materials and certain chemical compounds. H. A. WAISMAN, O. MICKELSEN, J. M. MCKIBBIN, and C. A. ELVEHJEM. (Wis. Exptl. Sta. et al.). (*Jour. Nutr.*, 19 (1940), No. 5, pp. 483-492, fig. 1).—The blacktongue-preventive method of Goldberger et al. and Sebrell et al. (*E. S. R.*, 74, p. 286) was followed with certain modifications, including supplying other vitamins of the B group in which the basal diet was deficient, in this study of the nicotinic acid potency of the various meats and meat products previously investigated for their content of thiamin (*E. S. R.*, 81, p. 741), riboflavin (*E. S. R.*, 82, p. 853), and the chick antidermatitis factor (*E. S. R.*, 82, p. 231). Mongrel dogs were kept on the basal diet until the first distinct drop in weight was observed, and were then given a single standardizing dose of 20 mg. of nicotinic acid and observed during the period of gain in weight and subsequent loss to about the original weight. The food to be analyzed was then fed at a level estimated to furnish approximately the same amount of nicotinic acid as the original standardizing dose. By comparing the gains on the standardizing dose and the food to be tested, the content of nicotinic acid per gram of food was calculated. It is noted that the same animals can be used more than once, but that to minimize errors each animal should be restandardized after two successive assays. Generally the food was tested on more than one dog or retested on the same dog.

As thus determined, the highest content of nicotinic acid was found in liver, the values ranging from 72 to 135 mg. per 100 gm. of dried tissue (8 samples). Kidney ranked with the lower values for liver, 3 samples ranging from 72 to 89 mg. per 100 gm. Heart, spleen, lung, and brain tissues were still lower, all values falling in the range of from 23 to 52 mg. per 100 gm. Muscle tissue of pork ham and loin, beef, and veal ranged from 15 mg. per 100 gm. of dry tissue for ham (boiled) and beef muscle to 70 and 72 mg. per 100 gm. for 2 samples of veal hindquarter. A third sample of veal hindquarter, however, gave a value of only 24 mg. per 100 gm.

A series of foodstuffs other than meat was tested by the same method. Among the values reported are skim milk powder from 4.3 to 6.2 mg. per 100 gm., bakers' yeast 50, brewers' yeast (6 samples) from 34 to 93, alcohol-soluble liver extract 450, liver extract powder 270, rice bran extract (commercial) 165, whey concentrate (commercial) less than 15, raw peanut meal 13, hard-boiled egg yolk less than 4 and white less than 2.5, wheat germ less than 4, and extracted wheat germ (commercial) less than 6 mg. per 100 gm.

A biological assay of riboflavin in the liver of the cow, calf, sheep, lamb, and hog. O. B. SAFFET, H. S. COX, B. L. KUNERTH, and M. M. KRAMER. (Kans. State Col.). (*Jour. Nutr.*, 20 (1940), No. 2, pp. 169-174, figs. 2).—Livers of beef, calf, lamb, and pork were purchased in the early fall and again in the winter and of mutton in the winter at local retail markets supplied from Kansas City packing plants. Each of the samples represented from two to six animals. The edible portions of the raw livers were run twice through a meat chopper (fine blade) and stored in glass containers at a temperature below 0° C. until used for riboflavin determinations by the Bourquin-Sherman method. The livers were fed in 200-mg. portions twice a week and riboflavin for comparison at levels of 2 and 2.5 mg. daily. A control from each litter received no supplement. From 8 to 15 rats were used for each sample of liver tested.

The riboflavin values, as estimated from the growth records, were lamb liver 4,950 and 5,400 μ g. per 100 gm., mutton (winter sample) 4,350, calf 3,450 and 4,350, beef 2,850 and 3,450, and pork 2,700 and 2,700 μ g per 100 gm. At the end of the experiment the positive controls and the test animals fed the livers with the higher riboflavin content were in excellent condition, with glossy fur and a normal appetite. Those fed pork liver were restless and in poor condition, with shaggy fur, and the negative controls were in extremely poor condition, with rough fur and poor muscular tone.

The bacterial assay of riboflavin in the urine and tissues of normal and depleted dogs and rats. H. F. FRASER, N. H. TOPPING, and H. ISBELL (*Pub. Health Rpts. [U. S.]*, 55 (1940), No. 7, pp. 280-289).—The nutritive status of normal and riboflavin-deficient dogs and rats was followed by the microbiological technic of Snell and Strong (*E. S. R.*, 82, p. 587), preliminary experiments having indicated that the method was sensitive to $\pm 0.01\gamma$ - 0.02γ of riboflavin and that it was possible to repeat assays on the same material within ± 10 percent. The experimental methods used are discussed in some detail as to selection of the animals (dogs and rats), diets and supplements served to these two groups and the assay value of these diets, method of assaying the tissues, and the clinical course of the animals.

Riboflavin assay values of dog and rat urines indicated that in some depleted animals there were substances in the urine inhibitory to the growth of *Lactobacillus casei*. Quantitative interpretation as to absolute quantities of riboflavin present were not justified, although the results permitted comparison of the relative excretion in the urine of normal and depleted animals. In the latter group there was a definite reduction in the urinary excretion of riboflavin, this effect being observed before the animals manifested significant symptoms of riboflavin deficiency. Various tissues assayed showed marked reduction of riboflavin in deficient animals as compared with the controls on stock diets or basal diets appropriately supplied with riboflavin. In dogs the variations within each group were so marked that these differences were not statistically significant; in rats, however, the differences were significant.

This bacterial method of Snell and Strong is considered a useful adjunct in determining the nutritional status of dogs and rats with respect to riboflavin.

Investigation of the vitamin C content of Florida fruits and vegetables.—I, **Effects of maturation and of cold storage on the vitamin C potency of oranges and grapefruit.** R. B. FRENCH and O. D. ABBOTT. (*Fla. Expt. Sta.*). (*Jour. Nutr.*, 19 (1940), No. 3, pp. 223-232, figs. 5).—For each phase of this study 4 doz. or more fruit were picked and taken to the laboratory for analysis within a day. The fruit was graded according to size and color and, with the exception of a few off-color fruit, a sample of 24 fruits was weighed and peeled with a glass knife, and the juice expressed through cheesecloth in a

porcelain-block press. Total acidity in the juice was determined with phenolphthalein as indicator and vitamin C by indophenol titration.

For the maturity tests the fruits used came from individual trees of three varieties—Parson Brown (early ripening), Pineapple (midseason), and Valencia (late ripening)—and were picked at intervals of 2 weeks from the green to mature stage. The advance of maturity was accompanied by a decrease of acidity in all of the oranges tested, the rate being about the same for Parson Brown and Pineapple, and a little greater for Valencia, and continued without apparent change in rate as long as the oranges remained on the trees. The content of vitamin C remained surprisingly constant during the 6-mo. period, any tendency to change being masked by individual variations. Unripe green oranges taken from different parts of the tree—top, bottom, inside, and outside branches—showed little variation in acid and vitamin C content, but after crop yellowing the fruit of the Parson Brown and Pineapple varieties that did not color gave juice of inferior quality and usually lower vitamin C content. The variability in vitamin C concentration among oranges of the same variety from different sources was much greater than among like-appearing oranges from the same tree. Oranges from different trees but in the same grove, tested by Beacham and Bonner (*E. S. R.*, 78, p. 728), had a comparable vitamin C content. The juice of samples of green very young Valencia weighing less than 10 gm. apiece gave an average vitamin C content of 347 mg. per 100 gm. for the outer rind and 335 mg. per 100 gm. for the inner portion, the high values indicating almost as great a total quantity of vitamin C as in the small mature fruit. With this exception, no association could be detected between the concentration of vitamin C and the weight, amount of peel, or volume of juice in the oranges tested.

Oranges of the Pineapple variety grown in the north, central, and east coast sections of the State, Valencias grown in the north and central sections, and Florida seedling grapefruit grown in the central and east coast sections showed no sectional differences, a conclusion supported by the data of Beacham and Bonner.

Pineapple oranges from six different sources and Florida seedling grapefruit from four different sources were put in storage at 42° F., and samples tested at frequent intervals for 5 mo. Seven of the ten samples showed variable increases in vitamin C content after storage for 1 mo., the average extent of the increase amounting to 26 percent. The other 3 samples showed decreases amounting to 20 percent, but it was found later that these samples had been processed before being shipped. There was some correlation evident between acidity and vitamin C content. In the 6 samples of Pineapple oranges studied throughout the whole storage period, 4 showed slightly higher acidity values accompanying considerably higher vitamin C values and 2 showed no such correlation. With the grapefruit, an association between the two was found in only one instance. The causes of increases noted was investigated but without positive conclusions. Hydrolysis of the juice of fresh fruit in 10 percent CO₂ produced no change in titration value to suggest an ester combination, nor could the presence of reversibly oxidized ascorbic acid be determined by the method of McHenry and Graham (*E. S. R.*, 75, p. 572).

The ascorbic acid (vitamin C) content of six varieties of cantaloupes, M. A. MOSELEY, JR., and G. H. SATTERFIELD. (*Univ. N. C.*). (*Jour. Home Econ.*, 32 (1940), No. 2. pp. 104-107).—From 13 to 20 cantaloups of each of 6 varieties, purchased in the ripe and very ripe state on the Raleigh, N. C., market soon after removal from the vines, were analyzed for ascorbic acid by the same methods as in the earlier study of watermelons (*E. S. R.*, 84, p. 283), using

15-gm. samples obtained from the edible portion by cutting from stem to bloom end. The varieties, with their average ascorbic acid content for all samples, were Rocky Ford 31.23 mg. per 100 gm., Perfecto 30.56, Baltimore 28.14, Wood Perfection 28.92, Hale Best 25.47, and Banana 20.91 mg. per 100 gm. For all varieties the ascorbic acid content was higher in the ripe than in the very ripe samples, but the differences were not uniform. The average values for all varieties were 20.54 mg. per 100 gm. for ripe and 20.66 mg. for very ripe samples. Large variations in ascorbic acid content occurred with the same variety, but there appeared to be no relationship between size of the cantaloup and its content of ascorbic acid. Good flavor was generally associated with high vitamin C content.

Storage of frozen vegetables: Vitamin C requirements [Vitamin C in vegetables, XI], R. R. JENKINS, D. K. TRESSLER, J. MOYER, and J. MCINTOSH. (N. Y. State Expt. Sta.). (*Refrig. Engin.*, 39 (1940), No. 6, pp. 381, 382, figs. 5).—In continuation of the series (E. S. R., 83, p. 135; 84, p. 135), the vitamin C contents of frozen vegetables stored at -40° , -29° , -18° , -12° , and -9° C. were determined from time to time during the storage period of from 6 to 10 mo. The vegetables stored were commercial packs of frozen asparagus, cauliflower, brussels sprouts, yellow wax beans, and Kentucky Wonder beans. All frozen samples were weighed at -18° and placed in cold acid before removal to the laboratory, where vitamin C was determined by the Bessey and King titration method as modified by Mack and Tressler (E. S. R., 78, p. 154). The results, presented graphically, indicate that a definite loss in vitamin C occurred in the frozen asparagus and brussels sprouts held at -18° for 6 mo. and that no appreciable loss of the vitamin occurred in the beans. This latter finding is noted as contrary to earlier results with Refugee green beans, which showed marked loss of vitamin C when stored for 6 mo. under similar conditions.

Influence of catharsis and diarrhea on gastrointestinal absorption of ascorbic acid in infants, A. F. ABT, C. J. FARMER, and Y. J. TOPPER (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 1, pp. 24-26).—Blood plasma, urinary, and fecal ascorbic acid values are reported for a normal 10-month-old infant on a mixed diet containing approximately 50 mg. ascorbic acid daily and supplemented with 300 mg. of ascorbic acid daily for 3-5 days in three series of tests with an interval of 5 days between the first two and 2 days between the second and third series. In a fourth period catharsis was induced by the administration of 4 gm. of $MgSO_4$ dissolved in water.

During the first three periods the range in plasma ascorbic acid was between 0.67 and 2.37 mg. per 100 cc., the highest value occurring on the date of the eleventh administration of supplementary ascorbic acid. On this date the urinary excretion rose from 61.26 mg. for the preceding day to 247.76 mg. and the fecal excretion amounted to only 3.92 mg. On the day following the catharsis, plasma, urinary, and fecal ascorbic acid values were 1.33 and 70 mg. per 100 cc., and 22.27 mg., respectively. A similar effect of diarrhea in increasing markedly the ascorbic acid content of the feces was evident in values obtained on a number of infants suffering from acute nonspecific diarrhea. One case is reported in which the administration of 200 mg. of ascorbic acid daily for 3 days was followed by little change in the ascorbic acid content of the blood plasma and excretion in the urine, but an increase in the feces value from 1.64 mg. on the first day of ascorbic acid administration to 52.4 mg. on the third.

"The increased fecal excretion of orally administered ascorbic acid during acute diarrhea in the infant points to its failure of absorption in the intestinal tract, and explains the low blood plasma values and low urinary excretion."

Food preferences of rachitic and normal rats, P. T. YOUNG and J. R. WITTENBORN. (Univ. Ill.). (*Jour. Compar. Psychol.*, 30 (1940), No. 2, pp. 261-276, pl. 1).—Rats maintained on rachitic and normal diets, respectively, were offered, by a preference technic described, a choice between cottonseed oil and this oil combined with cholesterol as a source of vitamin D; in other tests they were offered a choice between ground whole wheat and sugar. In the former test neither rachitic nor normal rats showed a preference for the oil containing the vitamin, even though some of the animals apparently had the sensory capacity to discriminate between the oils being tested. An attempt to train rats to select vitamin D, by leaving the vitamin-containing oil in the cage for 4 days, was unsuccessful as judged by the response to the two oils then offered in the preference apparatus. No generalizations are drawn from these results, since it is considered possible that rachitic rats might have shown a demand for the vitamin D had it been combined with some food other than fat. Fat was not much liked by the rachitic animals, and these, as judged by their running activity, had a lower demand than normal animals for fat. Rachitic rats were found very similar to normal animals in their increasingly frequent preference of sugar to wheat.

Treatment of rickets and tetany by parenteral administration of one massive dose of vitamin D, H. VOLLMER (*Jour. Ped.*, 16 (1940), No. 4, pp. 419-432, figs. 9).—Theoretical considerations are presented in support of the view previously expressed (E. S. R., 81, p. 745) that a single dose of 600,000 units of vitamin D is harmless. The correctness of this view is considered to have been demonstrated practically in that no toxic manifestations occurred upon administration of this dosage to 158 children.

Parenteral administration of this massive dose as shock therapy is recommended for rickets and tetany. Absorption of parenteral vitamin D depots can be accelerated by using a mixture of oil and ether (0.6 cc. of peanut oil and 0.4 cc. of ether) instead of oil alone as solvent. A number of case histories are noted briefly, and curves for blood calcium and phosphorus and roentgenograms are presented to demonstrate the efficacy of this treatment. The curves show that serum calcium and phosphorus become normal usually after 3-7 days, while roentgenographic evidence of calcification shows within 1 week, and recalcification is usually complete 30 days after the beginning of treatment. Tetanic convulsions cease within 24 hr. after the parenteral administration of the one massive dose of vitamin D.

Comparative activity of vitamin H curative of egg-white injury administered orally and parenterally to rats, P. GYÖRGY and C. S. ROSE (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 1, pp. 73, 74).—Quantitative data secured from experiments in which various preparations from yeast and liver of the factor curative of egg-white injury were administered simultaneously to two matched groups of rats, one orally and the other parenterally, showed that the factor is from 3 to 5 times as effective by parenteral as by oral administration.

Oral and parenteral toxicity of vitamin K₁, phthiocol, and 2-methyl-1,4-naphthoquinone, H. MOLITOR and H. J. ROBINSON (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 1, pp. 125-128).—In the studies on acute toxicity the dosages were suspended in peanut or sesame oil and administered orally or intraperitoneally (using 0.25 cc. of oil per 20 gm. animal body weight) to white mice and to chicks. The oral lethal dose 50 in mice was found to be approximately 0.2 gm. per kilogram for phthiocol and 0.5 gm. per kilogram for 2-methyl-1,4-naphthoquinone; no lethal effect could be produced by doses up to 25 gm. per kilogram of vitamin K₁. In the intraperitoneal injection of vitamin K₁, much of the oily suspension was still present after 10 days, indicating an extremely slow rate of absorption of vitamin K₁.

In the experiments on chronic toxicity conducted on rats, daily feeding of 0.35 gm. per kilogram of phthiocol or 0.5 gm. per kilogram of 2-methyl-1,4-naphthoquinone was found to cause the death of most of the animals on various days over a 30-day feeding period. Doses of 0.1 gm. per kilogram of phthiocol and 0.35 gm. per kilogram of 2-methyl-1,4-naphthoquinone produced a marked fall in erythrocyte count and hemoglobin. No such effects were observed following vitamin K₁ administration.

Prothrombin levels and synthetic vitamin K in obstructive jaundice of rats. J. E. FLYNN and E. D. WARNER (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 1, pp. 190-194).—Using the method of Greaves (E. S. R., 81, p. 748), young adult rats or rats selected at weaning were placed on a diet low in vitamin K, and after 7-8 weeks when the vitamin K reserves had been depleted the common bile duct was ligated. Under these conditions the prothrombin level dropped within 72 hr. to a level typically 10-25 percent of normal. At this stage the animals were given doses of phthiocol or 2-methyl-1,4-naphthoquinone administered in isotonic phosphate buffer solution by intravenous or intraperitoneal injection. Phthiocol in two daily doses of 1 mg. each brought the prothrombin level first from 16 to 47 percent and then to 91 percent; daily doses of 0.5 mg. did not always produce a rise in the prothrombin level, indicating that this dosage may represent approximately the daily maintenance requirement.

A single 20γ-dose of 2-methyl-1,4-naphthoquinone caused a rise in the prothrombin level to 81 percent of normal within 24 hr.; this level fell to 20 percent of normal within 3 days. A larger dosage on 2 consecutive days permitted the increased prothrombin level to be maintained for several days. These results indicate that the depleted animal can build up normal stores only when the vitamin is assimilated in larger amounts, or perhaps in smaller amounts over a long period of time. This observation has a clinical counterpart, in that cases of biliary tract disease must be given repeated doses of vitamin K₁ before and after operation in order to maintain the increased prothrombin level.

Micro-prothrombin test with capillary whole blood: A modification of Quick's quantitative method, K. KATO (*Amer. Jour. Clin. Pathol.*, 10 (1940), No. 2, pp. 147-153, figs. 2).—The test described uses small quantities of oxalated whole capillary blood instead of larger amounts of venous plasma, and measures the concentration of prothrombin in the oxalated blood in terms of its coagulation time upon recalcification in the presence of excess thromboplastin. Specifically, 0.20 cc. of capillary blood obtained by deep puncture is introduced into the hollow of a hanging-drop slide and mixed with an oxalate mixture previously deposited there by evaporation of 20 mm.³ of a 2 percent double oxalate solution (0.75 gm. K₂C₂O₄ and 1.25 gm. (NH₄)₂C₂O₄ per 100 cc.). The slide is placed in a moist chamber until the test is performed, which should be as soon as possible after withdrawal of the blood from the host, since prothrombin undergoes relatively rapid deterioration. For the test, 10 mm.³ each of a freshly made thromboplastin suspension (0.2 gm. dried, acetone-extracted rabbit brain in 5 cc. of N saline) and 0.025 M CaCl₂ solution are measured out into combination microhemopipettes and introduced into the well of a clean slide or spot plate. To this mixture 10 mm.³ of the oxalated blood are quickly added simultaneously with the clicking of a stop watch and agitated for 5 or 6 sec. with a fine glass rod. The formation of a gelatinous clot is the end point of the reaction and can be noted with the stop watch. Dilution curves obtained by plotting the coagulation times against the percentages of dilution show close agreement between capillary whole blood and venous plasma curves, the latter showing slightly lower coagulation times because of the relatively higher prothrombin content of cell-free plasma per unit volume.

The prothrombin in the blood of newborn mature and immature infants as determined by the micro prothrombin test, K. KATO and H. G. PONCHER (*Jour. Amer. Med. Assoc.*, 114 (1940), No. 9, pp. 749-753, figs. 6).—Using the microprothrombin test developed by Kato as noted above, the prothrombin time of the blood was determined in 100 mature and 73 immature infants during the neonatal period extending over 4 weeks of postnatal life. The prothrombin times, as determined at different periods and representing 894 tests in the former group and 701 in the latter, are presented by scattergrams; curves showing the averages for mature, immature, and all infants are given, the normal adult time (20 sec.) being indicated as a base line. For the mature infants the average prothrombin time on the first day of life was found to be 43.2 sec.; there was a gradual shortening as the infants grew older, and by the tenth day of life the average time was 25 sec. For the immature infants the average time on the first day was 46.5 sec.; on subsequent days there was much greater fluctuation than was the case with mature babies. Some of the immature infants even evidenced an increase in prothrombin time after birth. In one case this was associated with strangulated hernia. No correlation was found to exist between the degree of the infant's maturity and the prothrombin clotting time of the blood, at least on the day of birth.

Factors influencing plasma prothrombin in the newborn infant.—II, Antepartum and neonatal ingestion of vitamin K concentrate, L. B. SHUTTLES, E. DELFS, and L. M. HELLMAN (*Bul. Johns Hopkins Hosp.*, 65 (1939), No. 5, pp. 419-426, figs. 2).—A control study of mothers and infants receiving no vitamin K concentrate considerably augmented the one reported earlier (E. S. R., 33, p. 424) and showed average plasma prothrombin levels of 131.4 and 28.6 dilution units in 31 mothers and 32 full-term infants, respectively. In 15 mothers and 17 premature infants the averages were 142.2 and 10.9 units, respectively.

Five mothers who received daily 4,500 units of vitamin K by mouth for varying lengths of time (14-35 days) during the last month of pregnancy averaged 214.3 units at delivery as compared with 130.9 units prior to treatment. The prothrombin levels of the 5 infants averaged 80.3 units. In 9 mothers receiving orally 9,000 units of vitamin K concentrate less than 24 hr. prior to delivery the prothrombin level averaged 233.7 units. In the 9 infants the average was 78.7 units. One twin in each of 4 sets of double ovum twins received 1,000 units of vitamin K daily for a varying number of days after birth, while the other twin remained untreated. All infants receiving vitamin K showed a steady rise in plasma prothrombin, the levels tending to remain high even after cessation of therapy. The levels of the untreated twins remained fairly constant.

Plasma prothrombin curves for 14 normal untreated infants indicated that the prothrombin level of the newborn infant rises extremely slowly during early life. Curves for 13 infants receiving 1,000 units of vitamin K concentrate during the first 4 days of life indicated a rapid rise in plasma prothrombin during treatment, the high levels produced being maintained fairly well after cessation of therapy.

The treatment of hypoprothrombinemia with synthetic vitamin K: Report of two cases, H. A. FRANK, A. HURWITZ, and A. M. SELIGMAN (*New England Jour. Med.*, 221 (1939), No. 25, pp. 975-977, figs. 2).—The compound 2-methyl-3-phytyl-1,4-naphthoquinone synthesized by Fieser and previously established as vitamin K (E. S. R., 33, pp. 586, 587) was tested in clinical cases of obstructive jaundice. The synthetic vitamin (supplied by Fieser) was prepared for intravenous use by dissolving 10 mg. of the oil in 2 or 3 cc. of absolute ethanol and slowly introducing this solution by means of a pipette into 1,000 cc. of 10 per-

cent glucose in distilled water. Sterilization was effected by autoclaving the mixture or by boiling the component solutions separately. No ill effects having been observed upon administration of the compound in preliminary tests with animals, three normal human subjects were given intravenously 1,000 cc. of the freshly prepared colloidal suspension containing 10 mg. of the vitamin. No untoward reaction was noted in these cases, and there was no significant change in the prothrombin level or in the clotting and bleeding times. The vitamin was administered then to two individuals with obstructive jaundice and having elevated prothrombin times. Oral administration with bile or intravenous injection of the vitamin in 10-mg. doses in these cases produced a distinct drop in clotting time, the drop being optimal in 24 hr. for doses administered orally. Intravenous injection, however, produced a fall to normal levels within $\frac{1}{2}$ hr., the level staying within normal limits for several days in spite of operation within this time.

TEXTILES AND CLOTHING

Textile fiber atlas, I-VII, W. VON BERGEN and W. KRAUSS (*Rayon Textile Mo.*, 21 (1940), Nos. 1, pp. 57-60, pls. 2; 2, pp. 47-50, pls. 2; 3, pp. 53-57, pls. 2; 5, pp. 53-57, pls. 2; 6, pp. 49-53, pls. 2; 7, pp. 49-52, pls. 2; 8, pp. 49-52, pls. 2).—This series of articles, with bibliographic annotations, presents information as to the source of the various textile fibers and detailed descriptions of their microscopic structures. The descriptions are supplemented with photomicrographs of longitudinal views and cross sections of the fibers.

I. *Wool*.—A classification according to fineness, an approximate comparison of wool grades used in the United States, and a characterization of natural colored, raw, lamb's, shorn, and pulled wool are included in this section.

II. *Speciality hair fibers*.—Mohair and cashmere, camel, alpaca, llama, vicuna, and guanaco hair fibers are considered. A grade classification of mohair and fineness analyses (frequency distribution according to degree of fineness) of samples of commercial cashmere, camel, and llama hairs are given.

III. *Fur fibers*.—Angora rabbit, rabbit, hare, muskrat, beaver, raccoon, squirrel, and fox fur hairs are described, and the results of fineness analyses of a large number (100-1,000) of fibers of each are tabulated.

IV. *Minor hair fibers*.—Hog bristles and horse, human, goat, and cow hairs are considered, with certain indications as to their uses and with the tabulation of their diameter measurements.

V. *Silks*.—Cultivated and wild (tussah and Kuriwata) silks, both raw and degummed, are described, and cross sectional and width measurements are tabulated.

VI. *Cotton and minor seed hairs*.—The vegetable hairs, cotton (raw and mercerized), kapok, and pulu are considered, with tests for fiber maturity in cotton and with quoted data on width and cross sectional measurements of different types of cotton.

VII. *Bast fibers*.—Bast fibers of dicotyledonous plants, flax, hemp, jute, and ramie, are described. Width and cross sectional measurements and certain differential tests are given.

The relationship between price and certain properties of percale, D. SAVILLE (*Okla. Agr. Col., Household Arts Dept., Res. Pub. 1* (1940), pp. [1]+85, regular prices were 25, 19, 15, and 10 ct., although three groups were bought at two cities and one town in Oklahoma and from two mail-order houses. The regular prices were 25, 19, 15, and 10 ct., although three groups were bought at sale prices of 8, 13 $\frac{1}{2}$, and 19 ct. Sampling for tests was made in accordance with the procedures prescribed by the American Society for Testing Materials.

Percales with the greater number of yarns per inch had the greater weight per square yard, a higher breaking strength in both directions, and greater elongation in the filling direction. The filling yarn was finer and more highly twisted than the warp, although there was little variation in size and twist in either of these yarns. In number of yarns per inch, an 80-square percale was found to have as a finished fabric not 80 yarns warpwise and fillingwise but more than 80 yarns in the warp and less than 80 in the filling. The total yarn per square inch was near 160, however.

All of the percales withstood the test for ordinary laundry and domestic washing, and 24 were fast to washing with a bleach. As to fastness to light, however, only 11 pieces faded no more than the tentative standard dyeing of the American Association of Textile Chemists and Colorists after 40 hr. of exposure to the Fade-Ometer (equivalent to about 53 hr. of direct midday June sun), and only 1 piece was satisfactory after 80 hr. of exposure (106 hr. of June sun). Since the same color faded more readily in some pieces than in others, it appeared that the kind of dye used and not the hue was the important factor in color permanency. The amount of sizing in the percales varied from about 1 to 18 percent. On the whole, the lower priced percales had a much greater amount of sizing, although wide differences were found within a price group. By the test used the percentage of shrinkage in the warp ranged from 2.78 to 5.55 percent or about 1-2 in. per yard, and in the filling from 0.00 to 5.21 percent, or 0.00-1.88 in. per yard. Only 1 percale met all the requirements set up in the Federal specifications. Two others were satisfactory in every requirement except fastness of color to light.

Little information could be obtained at the time of purchase except as to number of yarns per inch and fastness of color to washing. Statements as to the yarn count sometimes underestimated and sometimes overestimated that found in the actual tests, and guaranties as to fastness of color to washing were not qualified or explained. The number of yarns per inch, breaking strength, weight per square yard, and sizing were found to be related to price, but there appeared to be no relationship between price and shrinkage, thickness, and fastness of color. The 25- and 19-ct. percales were similar in all features analyzed and the 15- and 10-ct. grades were alike; the wide differences came between the 15- and 19-ct. fabrics. Sale price percales compared favorably with others bought at the same price, but a percale at sale price might be a good buy, whereas at regular price it would not have been. From this study in general it is concluded that the consumer may expect to find a wide range in grade of percale at the same price and to receive little sale information that will help her to make a wise selection.

Recent developments in rayon and some of the newer manufactured textile fibers, F. BONNET (*Rayon Textile Mo.*, 21 (1940), Nos. 2, pp. 42, 43, 70, figs. 2; 3, pp. 41, 42).—Rayon, a cellulosic product, is characterized today by fine multifilament yarns of high tensile strength in contrast to the earlier rayon with its coarse fibers and low strength. The increase in strength has been accomplished by stretching the filaments during their plastic formation and fixation. This process is capable of varying the tenacity and extensibility of the resulting yarns over a wide range, thus permitting the production of yarns of different characteristics for different purposes. It is pointed out that certain modern high strength yarns are even being employed for heavy duty tire fabrics such as are used in buses and trucks. Commercial acetate yarns are not as strong as the viscose type of yarns, although by special "stretch" spinning processes (not yet in operation in the commercial stage) yarns of much greater strength and finer filament size have been produced. Certain specialty yarns such as "T and T"

(thick and thin) and abraded rayon yarn are now in demand. The former, with irregularly spaced thick and thin places, is obtained by transmitting a pulsating effect to the spinning solution or the filaments as they leave the spinnerette; the latter is obtained by deliberately abrading the outer filaments of a good continuous filament yarn so as to produce a "woolly" effect. Much of such abraded yarn is made of acetate rayon. Within recent years rayon staple has developed rapidly; the fiber is the same as in continuous filament yarn which has been cut to suitable lengths to be handled on cotton, woolen, and worsted machinery. This rayon staple is gradually entering the field of spun rayon yarns, giving additional strength and interesting effects, especially as blended with natural fibers such as cotton, linen, wool, etc.

Casein staple fiber with wool-like properties is prepared from washed fat-free curds of milk by dissolving them in caustic and spinning through regular spinnerettes and into an acid bath. The filaments, hardened by a treatment with formaldehyde, are washed and cut to the desired staple length. Casein staple fibers have been produced commercially in England, Italy (as "Lanital," "Cisalfa"), and German, but they leave much to be desired. Protein staple fibers from soybean and corn proteins have been produced experimentally.

Aside from cellulose and casein fibers, purely synthetic fibers such as Nylon and more recently Vinyon have been produced. Vinyon, of high tensile strength and true elasticity, is resistant to mineral acids and alkalis and is unaffected by alcohols, glycols, and aliphatic hydrocarbons; it is affected by ketones, halogenated hydrocarbons, ethers, and certain amines. Fiber glass, an inorganic material, has certain potential uses, primarily in industry; the use is limited by the fact that the fibers are brittle, have an elongation at break of only about 1-2 percent, and lose strength when fixed or abraded.

Some new textile fibers, F. BONNER (*Rayon Textile Mo.*, 21 (1940), No. 6, pp. 53, 54, fig. 1).—Essentially noted above.

"Vinyon"—the new textile fiber and yarn (*Rayon Textile Mo.* 21 (1940), No. 2, pp. 34, 35, figs. 2).—Vinyon, a synthetic fiber, is made from vinylite resin, which, chemically, is a copolymer of vinyl chloride and vinyl acetate, compounds derived from natural gas (or coal), salt, water, and air. In the production of vinyon fibers and yarns the vinylite resin in the form of a fine white powder is dissolved in acetone, the process being carried out at 50° C. The clear sirupy solution, known as "Vinyon dope," is converted at controlled temperatures and pressures into textile filaments at the spinning machine. After spinning, the yarns are stretched, this being a very special operation at elevated and strictly controlled temperatures (150° F. or higher), to increase tensile strength and reduce extensibility. Following this, the yarns are oiled, twisted, and redrawn on cones and spools.

Progress in the dyeing of Vinyon yarn and fabric has progressed and reds, blues, and browns have been dyed. The new textile is in use in industrial fabrics such as filter cloth and pressed felts, and an experimental program is being followed in the establishment of further uses. Bathing suits, glass curtains, upholstery, electrical insulation, chemical-resistant clothing, shower curtains, and fusible shape-retaining fabrics are some of the possibilities. "Laboratory work toward development of a Vinyon yarn for full-fashioned hosiery is now proceeding."

Finishing treatments applied to cotton hose, M. S. FURRY and L. E. WEIDENHAMMER (U. S. D. A. et al.). (*Amer. Dyestuff Rptr.*, 29 (1940), Nos. 8, pp. 203-205; 9, pp. 229-234, figs. 3).—Full-fashioned cotton hose, some bought on the open market and others knit to specification from high-quality commercially combed yarns of regular twist, were subjected by methods noted to 10 different finishing treatments of 4 general types. Finish 1 was a chemical

compound reacting chemically with cellulose; finishes 2, 3, 4, and 5 were of the class of water-repelling agents that deposit waxy materials on the fibers, being emulsions of wax and either aluminum acetate or formate; finishes, 6, 7, and 8 were insoluble soaps of chromium, aluminum, and cadmium; and finishes 9 and 10 were synthetic resins, urea-formaldehyde and acrylic, respectively, of a type commonly used to make fibers crease-resistant. To determine the effectiveness of these finishing treatments in improving the properties of cotton hose, a study was made of the elastic properties, the weight per unit area, and the bursting strength of untreated and treated hose before and after laundering 1, 5, and 10 times. Elastic properties were measured by the stretch load required to stretch the top circumference from 19.2 to 20.2 in., by the maximum load to stretch the circumference to 21.3 in., and by the recovery load at a circumference at 19.2 in. after the stocking recovers from maximum distention. The testing procedures are described, and the hosiery testing machine which was used to subject the stockings to 200 cycles of distention in the test for elasticity is illustrated.

The tabulated data, analyzed statistically in order to evaluate the differences in properties between hose treated with various finishes, indicate that in hose treated with finish 1, even after repeated launderings, the stretch load, maximum load, and stretch recovery ratio are consistently smaller and the recovery load greater than in unfinished hose. In other words, the treated hose stretch more easily and fit more snugly than similar untreated hose. The wax emulsions are similar to each other in their effect on elastic properties, causing the hose to stretch easily and fit snugly, and finish 2 in addition increasing the bursting strength; however, the effectiveness of these finishes is practically gone after five launderings. In hose treated with the three insoluble soaps the effects on elastic properties were rather difficult to interpret, but the chrome alum soap was the only one that did not wash out completely, the bursting strength of hose treated with the cadmium soap was significantly less after 10 launderings than that of the untreated hose similarly laundered, and the other two soaps did not cause much loss of strength on laundering. The two synthetic resins behaved very differently; the urea-formaldehyde resin increased the elasticity of the treated hose but made them very much weaker, while the methyl acrylate resin had no appreciable effect on the properties of the hose studied.

Water repellency of cotton hose, M. S. FURRY and L. E. WEIDENHAMMER. (U. S. D. A.). (*Rayon Textile, Mo.*, 21 (1940), Nos. 6, pp. 72, 73; 7, pp. 73, 74, figs. 2).—Hose treated with water-repellent finishes and used in the above study of elastic properties were tested in the present experiments, in which results were obtained for both treated and untreated hose that were laundered 1, 5, and 10 times. All samples were conditioned overnight and tested by two methods, an immersion test and a spot test. The former, a method for measuring resistance to absorption and devised by the authors especially for the testing of cotton hose, was based on the principle of rotation during immersion. In this test a 2-in. band from the ankle section of the hose was fitted snugly but without stretching on a smooth metal cylinder, the whole then being immersed in a beaker of water and rotated at 100 r. p. m. for 15 sec. The test piece was quickly removed and placed between two sheets of blotting paper over which a 1-kg. roller was then drawn. The sample was weighed before and after immersion, and the percentage of water absorbed was calculated from these weights. The spot test, especially suitable for testing the water repellency of hosiery, consisted in measuring by stop watch the time in seconds required for the absorption of 0.1 cc. of water placed on the hose drawn taut, but not stretched, over the open top of a beaker. Absorption was considered

complete when the little water films visible in the meshes of the hose broke and disappeared. For the most part the results obtained by the spot test bore out the conclusions indicated by the immersion test.

The results by this latter test, reported with notations as to the significance (as determined statistically) of differences between the unfinished and the finished hose, indicated that the finish furnished by the compound octadecyloxymethylpyridinium chloride, which reacted chemically with the cellulose, was the most highly water repellent of the finishes investigated. It did not wash out even after 10 launderings. Of the four wax emulsion finishes, only two were water repellent. One of these washed out, but the other was still effective after 5 launderings. Hose treated with the insoluble soaps were water repellent to some extent, and the chrome alum soap did not wash out completely. The methyl acrylate resin had little or no effect on the water repellency of cotton hose, but the urea-formaldehyde resin was effective, although it did not withstand repeated washings nor was it as water repellent as the compound which reacted with the cellulose.

HOME MANAGEMENT AND EQUIPMENT

Consumer expenditures in the United States: Estimates for 1935-36, H. KNEELAND ET AL. (*Washington: Govt., 1939, pp. IX+195, [figs. 23]*).—This report forms the second part of a larger study of consumption demands in relation to productive resources. The first report² from this study showed the amount of consumer income and how the total income was divided among the various groups of the population in 1935-36. The present report, showing how incomes were used, is based primarily on data obtained in the Study of Consumer Purchases, a nation-wide W. P. A. project conducted by the U. S. D. A. Bureau of Home Economics and the U. S. Bureau of Labor Statistics, with the cooperation of the National Resources Committee and the Central Statistical Board.

Detailed information on expenditures and savings during a 12-mo. period in 1935-36 was secured from a sample of more than 60,000 families living in cities and villages and on farms in 30 different States. These data, classified by income level according to occupation, color group, family composition, type of community, and region, served as the basis for average patterns of consumer spending for 99 major groups of families. Similar patterns from data for a smaller sample were built up for single men and single women. The spending patterns of all consumers are summarized to show how much was spent for food, clothing, housing, and other major classes of consumer goods and services; how much was spent for gifts and for certain personal taxes; and how much was saved. Consideration is also given to national consumption in 1935-36, with particular reference to the American consumer market, the savings of American consumers, income transfers through gifts and personal taxes, the consumption of institutional residents, and consumer services supplied by public and private agencies. Comparisons with other consumption studies are made. The appendices give statistical tables for reference use, state the sources and methods used in the study, and indicate the effect of size and distribution of income on national consumption.

Performance of electric roasters; F. MADDEN and L. J. PEET (*Iowa Sta. Res. Bul. 282 (1940), pp. 69-107, figs. 15*).—Six electric roasters, the characteristics of which are noted, were checked for empty performance, using standard electric oven tests, and for operating performance by a series of cooking tests.

² Consumer incomes in the United States: Their distribution in 1935-36, H. Kneeland et al. (*Washington: Govt., 1938, pp. VII+104, [figs. 19]*).

Power input was controlled, and interior temperatures were indicated by thermocouples and by a "thermosheet," connected to an indicating potentiometer. Methods used and data obtained in the various tests are given in some detail.

When the capacity of the various roasters was the same, their performance in preheating to various temperatures was similar in regard to time and kilowatt-hour consumption. Maximum temperatures reached for each thermostat setting were slightly lower with the thermosheet than with the thermocouple. Measurements of electric energy necessary to maintain certain interior temperatures showed that the roasters gained and lost heat at approximately the same rate after steady temperatures had been reached. In several cases less energy was required to maintain a roaster at a given temperature than to preheat it to that temperature. The thermostats were not highly accurate. Temperature changes indicated that roasters of equal capacity and power rating required approximately the same time to reach 500° F. and cooled at very nearly the same rate. Relative evenness of temperature was observed in measurements taken at either end and at the midpoint of each roaster. Surface temperatures, highest when the interior was the hottest, gave evidence of considerable heat loss through rim and lid. Determinations of temperature drop upon raising the lid were made under several conditions. Enamelware pans were found to absorb heat most rapidly, aluminum least rapidly, and glass and china utensils were intermediate. Aluminum pans did not retain the heat as well as those of other materials. To test the roaster for evenness of heat distribution for baking, foods of small mass (cookies, tarts, biscuits), medium mass (layer or angel cake), and large mass (cherry pies) were used. These could be baked satisfactorily in all roasters tested, but not always at the temperatures recommended by the manufacturer. Results indicated that the roaster may be used for baking operations without excessive kilowatt-hour consumption.

Training children for self-reliance, L. H. STOTT (*Nebraska Sta. Cir. 66* (1940), pp. 11, figs. 2).—This circular discusses in a nontechnical manner the implications of the findings in the investigation of personality development in children noted from the more technical reports (E. S. R., 82, p. 857). The complex nature of self-reliance is explained, and practical illustrations are given of the more important types of self-reliance, with suggestions to parents and teachers for ways of helping children to achieve a satisfactory measure of each type. Two factors considered of special importance are an atmosphere of geniality, confidence, and affection in the home and opportunity and encouragement for actual participation by the children in group discussions and activities in the home.

MISCELLANEOUS

Annual Report [of New Haven Station] for the year ending October 31, 1939, W. L. SLATE (*Connecticut [New Haven] Sta. Bul. 438* (1940), pp. 487-551).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. A tribute to the late W. E. Britton (E. S. R., 80, p. 573) is included.

Science for the farmer: Fifty-third Annual Report of the Pennsylvania Agricultural Experiment Station, [1940], [S. W. FLETCHER] (*Pennsylvania Sta. Bul. 399* (1940), pp. [4]+76, figs. 17).—The experimental work not previously referred to is for the most part noted elsewhere in this issue. A climatological summary for State College, Pa., for 1939 by C. O. Cromer and C. A. Kern is also included (pp. 73, 74).

Report of Puerto Rico Experiment Station, 1937 [trans. title], [A. LEE] (*Puerto Rico Sta. Rpt. 1937, Span. ed., pp. [2]+128, figs. 28*).—A Spanish edition of this report (E. S. R., 80, p. 572).

NOTES

Arkansas University and Station.—Dr. E. L. Nielsen, assistant professor of agronomy and assistant agronomist, resigned January 31 and was succeeded on March 1 by M. Alan Sprague as instructor in agronomy and assistant agronomist.

Colorado College and Station.—Dr. C. P. Gillette, since 1932 emeritus professor of entomology and zoology and emeritus director of the station, died January 4 at the age of 82 years. He was a native of Michigan, graduating from the Michigan College in 1886 and receiving the M. S. degree in 1887 and the honorary D. Sc. degree in 1916, and served there as assistant zoologist from 1886 to 1888. Dr. Gillette came to Colorado in 1891 after 3 years' service as entomologist in the Iowa Station. He organized the new department of zoology, entomology, and physiology, and became the first Colorado State entomologist in 1907 and director of the station in 1910. A recent tribute in *Science* notes in part that he "was known best for his work in entomology, although he maintained a deep interest in genetics and eugenics and taught classes in these subjects until his retirement. He was an entomologist of the old school, doing work in many parts of the field. Probably few men were better posted on the western economic insect problems."

Ramey C. Whitney, associate professor of economics, resigned February 28 to become associate agricultural economist with the U. S. D. A. Bureau of Agricultural Economics, with headquarters at Lincoln, Nebr.

Connecticut University and Storrs Station.—William F. Kirkpatrick, head of the poultry department, retired February 1. His service to the institution began in 1912 and was preceded by 5 years in the Rhode Island Station and 2 years in the Mississippi College and Station. He has been succeeded by Dr. H. M. Scott, associate professor of poultry husbandry and poultry production investigator in the Kansas College and Station.

Kentucky Station.—Dr. J. Allan Smith has been appointed bulletin editor.

Montana Station.—Margaret Dewey Ekeberg has resigned as station librarian and has been succeeded by Alice Vandenhook. Ray R. Woodward has been appointed assistant in animal husbandry in the North Montana Substation.

North Carolina College and Station.—Gertrude M. Cox, research assistant professor of the section of statistics of the Iowa Station, has become director of a newly organized laboratory of experimental statistics. Dr. J. A. Pinckard, Jr., assistant plant pathologist in the Virginia Station and since 1935 in charge of the research program on tobacco diseases at its Tobacco Substation, has been appointed associate plant pathologist. In this capacity he will have charge of the research program on apple diseases and assist in the program on root diseases of tobacco.

Ohio Station.—Dr. Robert E. Yoder has been appointed chief in the department of agronomy, effective January 15.

Wyoming Station.—A W. P. A. project to construct a nursery packing and storage building at the Goshen County Experiment Farm at an estimated cost of \$3,500 has been authorized.

EXPERIMENT STATION RECORD

Vol. 84

May 1941

No. 5

EXPERIMENT STATION RESEARCH FOR 1941 CONDITIONS

The increasing realization of the radical changes in the conditions under which agriculture is carried on in this country is leading to serious study as to the extent to which these changes should influence existing and prospective research programs. That the experiment stations are alert to this situation is brought out rather clearly by their latest annual reports and similar publications. While many of the reports for the past fiscal year are not yet available, those which are at hand contain a number of interesting discussions which probably constitute a fairly representative cross section of current opinion.

One of the most comprehensive statements thus far issued is from the California Station. In this report Director C. B. Hutchison points out that "the farmer's thinking has undergone a reorientation during the past two decades. No longer is the emphasis in agriculture laid on producing more, on making two blades of grass grow where only one grew before. The battle for production quantity has largely been won. Unfortunately, the victory has come at a time when mere quantity of production is no longer enough to bring success to the farmer's enterprise. . . . To achieve success he must strive toward low unit costs of production, high quality of product, constructive management of his resources, and efficient marketing. To attain these goals he needs the aid of those whose knowledge goes far beyond that of most men actively engaged in agriculture. He must make use of the results of research performed by scientists familiar with problems of engineering, sociology, economics, nutrition, chemistry, and the life sciences."

Director W. C. Coffey of Minnesota also is of the opinion that "under existing conditions it would be folly to advocate a program of research designed solely to increase the total output of American farms." Nevertheless he maintains that the problems surrounding production should continue to receive the attention of the station. Climatic conditions, plant and animal diseases, insect pests, political and social changes, and still other factors create problems affecting production which call for research. Although an adequate research program must include more than projects on problems of production and there is need for a comprehensive attack on the use of agricultural commodities

which involves both new uses and better adaptation of existing uses to consumers' desires and demands, he concludes that it is unwise "to attempt to meet this need by turning away from those problems of production which, if left unsolved, will tend to disrupt the structure of agriculture and in many cases impose complete failure on individual farmers."

A similar view is expressed by Director A. B. Conner of the Texas Station. "The work of the agricultural experiment station," he states, "is concerned with the development of the State's agricultural resources and opportunities. The fact that agriculture is faced with changing conditions, particularly at this time, requires an ever increasing knowledge of the resources about us and of means of augmenting, developing, and conserving these resources so that they may yield the greatest returns and opportunities for the people. Money spent for agricultural research must be regarded as an investment which in the end will open up new opportunities, new enterprises, and enable adjustments which affect not only those engaged in agriculture but as well the opportunities for industrial development. . . .

"Agriculture at the present time is encountering revolutionary changes which require a full measure of facts and information so that its reorganization can be based upon sound principles. For this reason there is great need for stimulating and developing agricultural research work that it may serve in the fullest way the reorganization of agriculture on a sound and substantial basis. Such a condition of agriculture is vital to our national welfare and to national defense, as well as imperative to the welfare of the people engaged in it. A well-developed and well-organized agriculture can provide the best means of meeting strenuous competition which we are likely to face both within and outside the borders of the Nation. Agriculture supplies raw materials and products for feeding and clothing the people of the Nation, and a well-organized agriculture can consistently expect to share in furnishing feed and clothing to the people of other parts of the world. These things can be accomplished in no other way than through basing our organization and development upon sound facts and information, much of which can be established only through research."

The continuing responsibility of the stations is referred to by Director C. Dorman of Mississippi as follows: "It should be emphasized that agriculture is Mississippi's chief industry, providing livelihood to approximately 85 percent of our people. It must continue to develop new and better practices and put them into general use; like other industries, it must improve or stagnate. The farmer, like the lawyer or doctor or businessman, is faced with new problems every year, and the solution of those problems can come only through increasing knowledge. Progress achieved in agricultural knowledge thus

far—extensive though it is by comparison—is, in reality, only the beginning. New things must be and will be learned in agriculture as in manufacturing processes, in medicine, and in invention. The experiment stations, farm fact finders, have a field of usefulness and a responsibility that increases from year to year.”

The fundamental nature of adequate research programs is attested by Director P. J. Parrott of the New York State Station as follows: “A distinguishing characteristic of present work of the experiment station is its emphasis on the necessity of precise knowledge of the principles relating to farm practices, which knowledge in turn should serve as the foundation for a sound and profitable agriculture. More than any other thing, research extends the horizon of economic insight and imparts a forward thrust.”

A tendency sometimes encountered to advocate the postponement or curtailment of research as an economy measure is mentioned in several discussions. On this point, Director R. H. Walker of Utah declares that “the foundation of progress in agriculture, as in any other industry, is research. . . . Research undertaken by the Utah Agricultural Experiment Station has been outlined to solve specific problems facing Utah agriculture, among them the problems of irrigation, dry farming, range management, and animal production. The prosperity of the State is dependent upon the success of these agricultural enterprises. Agricultural research should not, therefore, be considered a luxury marked for elimination, or materially decreased support, every time the State or Nation is faced with an emergency.”

Along much the same line, Director W. L. Blizzard of Oklahoma points out that “during times such as these, with the United States entering upon a major defense program, there is a strong temptation to reduce support for research, since research does not produce the immediate results that are shown by a service activity. It is to be noted, however, that services are the product of research activity. The continued effectiveness of such an organization as the Oklahoma Crop Improvement Association, to take but one example, rests upon the improved varieties of crops developed by research men and upon the continual testing of Oklahoma-grown seed to assure that the improvement bred into the varieties is being maintained.”

Director Blizzard's further contention is that “with a national defense program under way, the scientific arm of the agricultural industry must be kept intact and ready to cope with any problem demanding the services of trained scientists. Research must be continued to guarantee for the future the adequate supply of clothing, food, and agricultural raw materials essential to defense. It may be needed at any time to combat disease or insect pests. Despite present surpluses, it may be needed in the future to step up production to meet an emergency. And it is needed now to assist in the development of more

equitable means of distributing present production, to the end that our entire population shall be adequately clothed and fed; for a population well clothed and well fed will contribute materially to defense in an era when warfare is directed as much against the morale of the civilian population as it is against the soldier in uniform. Furthermore, research will continue to be needed after the present crisis is over, for it is certain that new and perplexing problems demanding adjustments of all sorts will face farmers then, just as they did following the last World War."

According to Director J. A. Hill of the Wyoming Station, "the world crisis which came with the war in Europe in September 1939 is having a profound effect upon the agricultural economy of the United States. The rearmament program makes it necessary for the whole agricultural plant of the Nation to achieve the highest possible efficiency so as to release millions of men from the production of food and fiber in order that they may build and man a fighting machine which will insure the Western Hemisphere against war and aggression. Scientific research in agriculture is an important means by which this can be accomplished."

Director W. H. Martin of New Jersey is another who discusses the field of the stations as an essential part of the national defense. He suggests as among the research activities which might be inaugurated or expanded by the experiment station in time of emergency, "the development of economical substitutes for use in human and animal nutrition, especially substitutes for imported materials; investigation of new methods of storing and preserving food and feedstuffs; increased production, testing and certification of seeds, especially those which are now imported; increased testing of soils coupled with recommendations for the most effective soil treatments."

"Seldom have world events," he maintains, "taken on such immediate significance to New Jersey farmers as they have today. That fundamental changes are about to take place in the lives of all of us seems to be inescapable. As citizens and as farmers, the agriculturists of New Jersey will participate in these changes. Their scope and direction is as yet not altogether clear, but it would appear to be evident that a maximum of flexibility in thought and action will be essential for adjustment and survival."

The flexibility of program to which Director Martin refers is surely of much importance under present conditions. In this connection a news note recently supplied by Director S. W. Fletcher of Pennsylvania is of significance. According to this note, "on March 14 a conference was held to consider the need for redirection of the research program of the Pennsylvania Experiment Station in the interest of national defense. Representatives of farm organizations of the State and of all the State and Federal agencies that serve Pennsylvania

agriculture participated. Since the demands of national defense on agricultural research are still undefined, continuation of the present program was recommended. It was recommended to the experiment station that it hold some funds in reserve to meet emergencies as they may arise. Farm groups were requested to report difficult local situations to the State Agricultural Defense Council, which will enlist the cooperation of the experiment station when research is needed. More research on the problems of low-income farms was requested. The experiment station was requested to study the interrelationships of agriculture with other industries and with labor."

Under emergency conditions many new problems will arise, and for these the stations should, as far as possible, be ready. The following suggestions, made in these columns in January 1918, may still be pertinent: "The world conflict will not alter the content of science but will serve to increase dependence upon it. The best the stations can do in the main is, while relating their work and the results secured in the past to the special needs of the present, to preserve their organization and aims, to maintain their attitude toward experimental inquiry, and to continue to serve in the capacity of experts in agricultural science and in its interpretation in practice. But in this they will need to be governed by existing conditions to an unusual degree. In the past they have wisely been engaged to a large extent in developing the basis for permanent agriculture, and this has led them into lines of study which have become increasingly technical and fundamental. . . . The needs of the Nation in time of emergency are abundant justification for such temporary change and adjustment as necessary, for they are paramount considerations. The subjects worthy of our best thought and highest endeavors are those which deal with utilizing our science and directing it to questions and procedure which are just now vital."

There is much reason to believe that on the whole the stations are already attempting to meet their full responsibilities in these directions.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations at the New York State Station] (*New York State Sta. Rpt. 1940, pp. 18, 19, 44*).—These have included work on the structure and denaturation of proteins, the effects of ultraviolet light on amino acids, proteins, and synthetic peptides, and the use of plant tissue tests for soil deficiencies.

[Chemical investigations by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1939, pp. 2-22, 28-40, 120, 121, figs. 6*).—These included vanilla investigations, particularly as to curing and processing, extract preparation, and the toxicity of vanilla latex; essential-oil investigations with *Lippia helleri*, *Eugenia buxifolia*, lemon grass (*Cymbopogon citratus*), ilang-ilang (*Cananga odorata*), and *Eucalyptus citriodora*; and work on the improvement of orange wines.

[Investigations in bacteriological chemistry at the Wisconsin Station] (*Wisconsin Sta. Bul. 450 (1940), pp. 15, 16, fig. 1*).—The growth factor biotin has been shown, by P. W. and J. B. Wilson, to stimulate the growth of legume bacteria. *Clostridium madisonii*, isolated by E. McCoy, has been found especially effective in the butyl alcohol fermentation of molasses and to be resistant to the virus attacking butyl alcohol bacteria. Work by I. L. Baldwin, A. M. Hanson, C. B. Holden, W. H. Lohr, and R. S. Hutton on yeast-growth stimulation by minute quantities of copper is also reported.

[Reports on methods of analysis] (*Jour. Assoc. Off. Agr. Chem., 23 (1940), No. 2, pp. 183-189, 201-234, 242-282, 341-351*).—The following reports were among those presented at the 1939 meeting of the association: Volatile acids in wine, M. A. Joslyn (Univ. Calif.); soils and liming materials, W. H. MacIntire (Tenn. Expt. Sta.); H-ion concentration of soils of arid and semi-arid regions, W. T. McGeorge, and pH determination of alkali soils, W. T. McGeorge and W. P. Martin (both Ariz. Sta.); hydrogen-ion concentration of soils of humid regions, E. R. Purvis (Va. Truck Sta.); liming materials—determination of exchange bases and exchange capacity of soils, W. M. Shaw (Tenn. Sta.); fertilizers, G. S. Fraps (Tex. Sta.); nitrogen, A. L. Prince (N. J. Stas.); magnesium and manganese, J. B. Smith and E. J. Deszyck (R. I. Sta.); potash, O. W. Ford (Ind. Sta.); calcium, copper, zinc, and sulfur, G. Hart and W. Y. Gary; vitamin D—feeding of non-vitamin D skim or whole milk with the reference cod-liver oil, W. C. Russell (N. J. Stas.); and riboflavin, A. R. Kemmerer (Tex. Sta.).

A semimicro-Kjeldahl method for the determination of total nitrogen in milk, S. G. MENEFFEE and O. R. OVERMAN. (Univ. Ill.). (*Jour. Dairy Sci., 23 (1940), No. 12, pp. 1177-1185, fig. 1*).—The method and apparatus is described. Mercuric oxide is recommended as a catalyst with boric acid as the ammonia-receiving agent and methyl red-methylene blue as the indicator. The data presented showed close agreement between the semimicro and the Official methods. This method is considered well adapted to routine analysis and is particularly useful for detecting small amounts of nitrogen.

Comparative studies upon the methylene blue and resazurin tests, L. LITTLE (*Jour. Milk Technol.*, 3 (1940), No. 5, pp. 274-279).—Findings reported are based on the application of the methylene blue reduction test, the resazurin test, and direct microscopic counts to 304 samples of milk. The average reduction time of resazurin to purple pink averaged 0.452 that of methylene blue. Agreement between the two color tests was best on very low quality milks. Resazurin was relatively more sensitive to pathological and physiologically abnormal milks than methylene blue and also offered a more distinctive reaction to aid in their detection. The resazurin test checked slightly closer with the microscopic count than the methylene blue test. However, the two color tests checked more closely with each other than with the microscopic count.

Improved method for rapid estimation of lead in maple products, C. O. WILLITS, L. B. NORTON, and C. J. TRESSLER, JR. (N. Y. State Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 2, pp. 411-416).—A rapid and accurate method for determining minute quantities of lead was necessitated by work directed toward the detection of sources of lead contamination of maple sap, sirup, and sirup products. The electrolytic and sulfide methods were shown to be unsuitable. The authors developed a form of the "dithizone" (diphenylthiocarbazone) method. Their procedure employs a photoelectric photometer in place of the neutral wedge photometer. The Wratten light filter No. 65A, having a transmission maximum near that of the unchanged dithizone but a high absorption in the wave length range transmitted by the lead compound of this reagent, was used in a "mixed-color" method.

A comparison of the Petering-Wolman-Hibbard procedure for determining carotene, and two modifications thereof with the Peterson-Hughes-Freeman technic, E. J. BENNE, W. WOLMAN, R. P. HIBBARD, and E. J. MILLER. (Mich. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 3, pp. 709-716, fig. 1; *abs. in Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, pp. 115, 116).—The authors have developed a method which permits the determination of both chlorophyll and carotene in the same sample of plant tissue. The finely ground tissue is extracted with an aqueous-acetone solution, which is made to volume, and both pigments are determined in this extract by means of a photometric colorimeter. Chlorophyll is determined directly in the extract by use of proper light filters in the instrument. Carotene is determined, likewise by photoelectric means, in a petroleum ether extract of an aliquot of the same solution after chlorophyll is removed by barium hydroxide and the xanthophyll and flavones are separated from carotene by the usual methods.

The estimation of riboflavin, I-III (*Biochem. Jour.*, 34 (1940), No. 4, pp. 601-612, figs. 2).—This paper is presented in three parts.

I. A new biological method, M. M. El Sadr, T. F. Macrae, and C. El. Work (pp. 601-607).—The method depends upon the fact that treatment of extracts of liver or yeast with the norite charcoal yields a filtrate containing all of the known constituents of the vitamin B₂ complex except riboflavin. When young rats are fed this filtrate with graded doses of riboflavin as supplements to a vitamin B complex basal ration there is a graded growth response. Consequently, the riboflavin content of foodstuffs may be determined by employing this filtrate as the riboflavin-free supplement to the diet.

II. The estimation of riboflavin in milk: Comparison of fluorimetric and biological tests, K. M. Henry, J. Houston, and S. K. Kon (pp. 607-609).—The biological method of assay of riboflavin described in part 1 has been compared with the fluorimetric method following the procedure described by Henry et al.

(E. S. R., 82, p. 385), using full cream spray-dried milk and evaporated milk. Good agreement was found when the milks were fed at levels supplying up to 10 μ g. daily, but the agreement was not so satisfactory with higher levels. For the three materials tested, the values obtained by the biological and fluorimetric methods, respectively, were spray-dried milk fed at levels of 0.9 and 1.8 gm. daily, 15.2 and 10 μ g.; a sample of the same dried milk fed at levels of 0.5 and 1.0 gm., 9.3 and 10.3 μ g.; and a sample of evaporated milk fed at levels of 2 and 4 gm., 2.6 and 2.9 μ g. per gram.

III. *Statistical analysis of the data*, J. O. Irwin (pp. 610, 611).—The significant point brought out in the statistical examination of the data is that the slope of the standard curve obtained from the data of El Sadr et al. is significantly steeper than the slopes for standard from the data of Henry et al. "The fact that significantly different slopes for the standard curve may occur in different laboratories emphasizes the necessity of using at least two doses of standard and two doses of the unknown preparation in routine testing."

The determination of vitamin E (the tocopherols) [trans. title], F. GRANDEL and H. NEUMANN (*Ztschr. Untersuch. Lebensmitl.*, 79 (1940), No. 1-2, pp. 57-65).—A review of methods, both biological and physicochemical.

Farm products and byproducts for industrial use (U. S. Dept. Agr., Bur. Agr. Chem. and Engin., 1940, ACE-55, pp. [3]+69).—The present statement is in part a condensation and revision of basic data contained in a report¹ of a survey made by the Department relative to the establishment of four regional research laboratories (E. S. R., 80, p. 289). It is intended to provide "a brief summary of background facts that will be useful to those who wish information on the utilization of farm products and byproducts in industry."

Utilization of fruits in food products, II-VI, W. V. CRUESS. (Univ. Calif.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1940), Nos. 6, pp. 164-166, 174, figs. 2; 7, pp. 198-201, 203, 219, figs. 4; 9, pp. 260-262, 281, figs. 2; 10, pp. 297-299; 11, pp. 325, 326, 330, 343, figs. 2).—This series of articles, dealing primarily with commercial utilization, gives practical suggestions for various ways of using fruits (and in some cases fruit juices) (2) in the candy industry, (3) in carbonated and canned beverages, (4) ice cream and ices, (5) canned and glass-packed specialties, and (6) in cereal products, including baked goods.

Salting of green tomatoes, F. W. FARMAN and F. J. ERIKSON. (Mich. Expt. Sta.). (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1940), No. 12, pp. 363-367, 377, 379, figs. 2; abs. in *Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, pp. 116, 117).—Cabbage, cucumbers, and green tomatoes have average sugar contents of 3.4, 2.57, and 0.99 percent, respectively, and sugar sufficient to bring the concentration up to that of the cucumbers should be added in salting green tomatoes in order to bring about a satisfactory fermentation and acid production. The best results were obtained when dextrose was added to a brine of 30° salometer strength in the proportion of 2.5 percent of the weight of the green tomatoes. A salt concentration sufficient to exclude spoilage bacteria (from 40° to 50° salometer) nearly or quite prevented fermentation by acid-producing bacteria, and satisfactory tomato color and texture were not obtainable.

Effect of CO₂ on growth of meat spoilage organisms at low temperatures, W. L. MALEMMANN and L. ZAIKOWSKI. (Mich. Expt. Sta.). (*Natl. Provisioner*, 103 (1940), No. 7, pp. 16, 17).—The authors isolated from beef 74 cultures of micro-organisms representing the genera *Micrococcus*, *Flavobacter*, *Bacillus*, *Achromobacter*, *Diplococcus*, *Gaffkya*, *Staphylococcus*, *Bacterium*, and *Sarcina*. These organisms were all found to multiply at temperatures of from

¹ U. S. Senate, 76. Cong., 1. Sess., Dec. 65 (1939), pp. VII+429, figs. 40.

3.5° to 5° C. in the absence of carbon dioxide, but in the presence of 10 percent of carbon dioxide the numbers of bacteria decreased. In an atmosphere of 2.5 percent carbon dioxide some bacteria grew very slowly. The data indicate that the use of 2.5 percent carbon dioxide atmospheres in meat storage boxes would prolong the keeping quality of the meat.

AGRICULTURAL METEOROLOGY

Discussion on plant diseases and the weather (*Brit. Mycol. Soc. Trans.*, 24 (1940), pt. 2, pp. 264-266).—Abstracts of the following papers are given: Weather in Relation to Plant Disease Survey Records, by W. C. Moore; Apple Canker and the Weather, by R. W. Marsh; A Functional Disorder of Cultivated Varieties of *Rubus*, by R. V. Harris; Climate and Disease in Australia, by T. H. Harrison; The Strawberry Yellow-Edge Disease in Relation to Weather Conditions, by M. E. King and R. V. Harris; The Effect of Weather on Some Diseases of Apple and Morello Cherry, by M. H. Moore; and Potato Blight and the Weather, by A. Beaumont.

Weather forecasting terms, H. LANDSBERG. (Pa. State Col.). (*Amer. Met. Soc. Bul.*, 21 (1940), No. 8, pp. 317-320).—A consideration of terminology based on discussions by the Central Pennsylvania Seminar of the American Meteorological Society.

Suggestions for improved presentation of weather information to the public, G. EMMONS (*Amer. Met. Soc. Bul.*, 21 (1940), No. 8, pp. 311-316).

Proposal for frequent and dependable weather reports from off the Pacific coast, W. H. WENSTROM (*Amer. Met. Soc. Bul.*, 21 (1940), No. 8, pp. 321-323, fig. 1).—Semipermanent offshore weather stations are suggested in the interest of more dependable forecasting for California coastal areas.

Occlusions on the Alaskan coast, A. B. CARPENTER (*Amer. Met. Soc. Bul.*, 21 (1940), No. 8, pp. 327-332, figs. 4).—The use of frontal analysis in recent years has helped to explain some of the peculiarities of storms crossing the Alaskan coast into western Canada. In view of the practical importance of the subject, the author here summarizes certain results from analysis of maps during the past few years, especially from a series of twice-daily charts for the winter season of 1938-39 covering the entire North Pacific area and including parts of Siberia, China, Japan, and the Philippines. The structure and behavior of two typical situations, one in fall and one in late winter, are discussed.

The use of isentropic layer data to determine stability, P. J. HARNEY (*Amer. Met. Soc. Bul.*, 21 (1940), No. 7, pp. 279-281, fig. 1).—Knowledge of stability is to be desired when shower activity is likely, but it is also important in studying mixing processes in the atmosphere. This note calls attention to a convenient quantitative measure of the stability of a layer, useful because it can be rapidly noted from data now transmitted to stations.

The coupling between tropospheric and stratospheric pressure and temperature variations, C. M. PENNER (*Amer. Met. Soc. Bul.*, 21 (1940), No. 7, pp. 283, 284).—An abstract.

Calculation of the incident light from sun and sky [trans. title], E. ELVEGÅRD and G. SJÖSTEDT (*Gerlands Beitr. Geophysik*, 56 (1940), No. 1, pp. 41-48, fig. 1; abs. in *Sci. Abs., Sect. A—Phys.*, 43 (1940), No. 512, p. 610).—It is stated that the average illumination of a horizontal plane for different solar altitudes can be approximated by the formulas $S=1.6 \sin h \times 10^{-0.1M}$ for solar illumination, $H=0.211 \sqrt{\sin h}$ for the clear sky, and $W=\alpha S + \gamma H$ for the cloudy sky, in which α and γ are the rates of radiation penetrating the clouds from the sun and sky, respectively, M is the air mass through which the sunlight

has passed, and h the altitude of the sun. The total illumination of a horizontal plane at a solar altitude of 45° is taken as unity.

An improved design of cup anemometer, P. A. SHEPPARD (*Jour. Sci. Instruments*, 17 (1940), No. 9, pp. 218-221, figs. 5).—In the new type of 3-cup anemometer described, the minimum wind velocity in which it will function satisfactorily, about 40 ft. per minute, is appreciably lower than usual with this type of instrument, and compares favorably with other sensitive but more troublesome types involving movable parts. The rate of rotation of the cups is related linearly with the wind velocity, and consequently the indicated mean value of the velocity in a gusty wind is true, apart from the effects of inertia. The inertia of the moving parts is small, so that the anemometer is very responsive to changes in wind velocity and overestimation in a gusty wind is negligibly small. The apparatus is portable and of relatively small dimensions.

A new electronic anemometer, E. F. CORWIN (*Amer. Met. Soc. Bul.*, 21 (1940), No. 8, pp. 337-340, figs. 5).

A design for a geostrophic wind scale, C. V. BROWN. (U. S. D. A.). (*Amer. Met. Soc. Bul.*, 21 (1940), No. 5, pp. 178-181, fig. 1).—A scale may be constructed for any degree of latitude and for any distance between isobars by plotting the ordinates on a scale of log sine of latitude and the abscissa on a scale of map distance in miles. The resultant wind movement may then be plotted as sloping lines by connecting points for each 5° or 10° of latitude along the resultant map distance for each distance between isobars. Its use, with examples, is discussed.

An improved electrical hygrometer and its applications, F. W. DUNMORE (*Amer. Met. Soc. Bul.*, 21 (1940), No. 6, pp. 249-256, figs. 7).—This is a more detailed account (E. S. R., 88, p. 18), including construction details, operating characteristics in D. C. current radiosonde circuits, and in A. C. measuring circuits, designs for special uses, and radio soundings using the electric hygrometer. "Flight tests with two radiosondes carried by the same balloon, one using the electric hygrometer and the other the hair type hygrometer, showed marked changes in humidity recorded by the electric hygrometer which the hair unit failed to register."

Meteorological observations, [1940], C. I. GUNNESS ET AL. (*Massachusetts Sta. Met. Ser. Buls.* 613-624 (1940), pp. 4 each).—These are the usual summaries of observations for each month at Amherst, Mass., with brief notes on the more significant features.

The December number contains an annual summary for 1940, which shows that the mean pressure for the year was 30 in.; the mean temperature 46.1° F., as compared with the normal of 47.4° , highest 94° July 26, lowest -10° December 4; total precipitation 43.37 in., as compared with the normal of 43.7 in.; snowfall 54.75 in., as compared with the normal of 47.78 in.; mean cloudiness 54 percent, bright sunshine 52.8 percent; last frost in spring May 13, first in fall September 27; last snow April 22, first November 16.

Hurricane floods of September 1938 (U. S. Geol. Survey, *Water-Supply Paper* 867 (1940), pp. IX+562, pls. 20, figs. 61).—This report presents records of stage and discharge for the period including the flood at about 240 stream-gaging stations, records of storage in many reservoirs, a summary of peak discharges with comparative data for other floods at about 530 measurement points, and tables showing crest stages along an aggregate length of stream channel of 1,450 miles; and records of daily observations of precipitation during the period September 12-21 at about 745 places, of more frequent observations of precipitation at about 110 places of measurement, of ocean-wave

height at about 230 locations along the coast, and of water level in 31 observation wells on Long Island. The report also includes basic information in regard to the hurricane and general weather conditions associated with floods, analyses of rainfall and run-off, discussions of storage and ground-water recharge, and many other data pertinent to the floods.

The climate of Juan Viñas [trans. title], J. LEÓN (*Rev. Agr. [Costa Rica]*, 12 (1940), No. 11, pp. 487, 489-491, 493, 494, figs. 3).—Data on the temperature, humidity, wind, and rainfall of this Costa Rican region are presented, with special reference to agricultural and soil relations.

SOILS—FERTILIZERS

Reading for soil scientists, together with a library, C. E. KELLOG. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 11, pp. 867-876).—The author suggests 19 references on soil science, 19 works on related sciences, 13 sources on early agriculture, 19 references on general science, 40 contributions of philosophy and history, 53 novels, 14 bibliographies, and 48 works on drama and poetry as satisfactory reading material for soil scientists.

[Soil investigations by the Montana Station]. (Partly coop. U. S. D. A.). (*Montana Sta. [Blen.] Rpt. 1939-40*, pp. 23, 24, 51, 52).—This report notes work on the effect of phosphate fertilizers on the yield and phosphorus content of forage crops, the location of phosphorus-deficient soils in Montana, and factors inhibiting the productivity of Montana soils, all by A. R. Patton. Soil-moisture investigations in relation to agricultural practices and studies on the maintenance of soil productivity are reported upon by A. E. Seamans.

Soil surveying fundamental to efficient land-use planning, D. S. JENNINGS and L. WILSON (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 4, pp. 1, 8, 10, fig. 1).—The value of soil-survey information for land-use planning agencies and for the farmer is discussed. Reports from farmers throughout the State indicate that soil productivity has declined, on the average, about 25 percent since the soil was first cultivated, this decline being attributed to the lack of sufficient information as to the physical, chemical, and biological properties of the soil to determine the most satisfactory system of land management.

Preservation of soil profiles by Voight's [Voigt's] method, W. H. LYFORD, JR. (*Soil Sci. Soc. Amer. Proc.*, 4 (1939), pp. 355-357; also *New Hampshire Sta. Sci. Contrib.* 78 [1939], pp. 355-357+2).—The author slightly modified the method of E. Voigt² and showed it to be very satisfactory for the preservation of sandy and stony soil profiles collected in New Hampshire.

According to the author's form of this method a profile section about 8 in. wide is cut vertically and brushed free from the looser particles. Stones larger than a hen's egg are to be avoided since they are not easily supported by the film. Small, deep holes left by small stones are filled up, and roots are cut off about 0.5 in. from the face of the profile, wire cutters being used to avoid disturbance of the surrounding soil. More satisfactory profiles were obtained when the soil was sprayed with the binder while at normal moisture content than when the soil surface was first allowed to become nearly or quite dry. As binder a clear cellulose nitrate airplane "dope" was used. About 0.5 pt. of a 2:1 dilution of the cellulose nitrate preparation with acetone was first spread on the profile surface, and, after from 10 to 20 min., a further coating of the undiluted cellulose nitrate solution was brushed on. A second brushing coat, applied 0.5 hr. or more after the first, was usually

² Ztschr. Pflanzenernähr., Düngung u. Bodenk., 45 (1936), No. 1-2, pp. 111-115, figs. 4.

necessary to provide a film of sufficient strength. The film was detached before becoming completely dry because it was more flexible and more easily detached in this condition. The films were loosened from the bottom upward, with the use of a knife to free from the soil any stones adhering to the film. Heavy profile films were laid on strips of plywood to allow them to be carried with less danger of cracking or dropping. Curling of the profile films was best avoided by adding from 0.5 to 1 oz. of castor oil to the stock cellulose nitrate solution.

The cost per profile, mounted on a plywood backing, was from 75 ct. to \$1, and the total time, for taking a single profile, from 2 to 3 hr. Several profiles could be collected at neighboring points with much saving of time, and on the collecting trip the films could be left to dry and removed on the way back.

Notes made in 1940 of modifications of the method are appended to the station's publication.

The electro-chemistry of soil formation.—IV, The salt effect on amphoteric colloids and phosphate fixation, N. KARLSSON and S. MATTSO (Lantbr. Högsk. Ann. [Uppsala], 8 (1940), pp. 405-424, figs. 4; *Swed. abs.*, p. 423).

The pH and the amphoteric behavior of soils in relation to the Donnan equilibrium, S. MATTSO and L. WIKLANDER (Lantbr. Högsk. Ann. [Uppsala], 8 (1940), pp. 1-54, figs. 24).—Studies of the property of amphoteric soils to exchange H and OH ions for the cations and anions of a neutral salt solution, at or near the equi-ionic point of the soil, and the valence effect in the mass law have given significant results.

A study of the base exchange capacity of typical native sods and cultivated soil profiles of Colorado, together with the effects of saline irrigation waters upon adsorptive soil complex (*Colorado Sta. Rpt. 1940*, p. 21).—Data on base-exchange capacity of some 40 native sods and cultivated soil profiles of Colorado and the effect of saline irrigation waters upon the adsorptive soil complex are briefly referred to.

Some factors which influence infiltration and its measurement in Houston black clay, C. W. LAURITZEN and N. L. STOLTENBERG. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 52 (1940), No. 11, pp. 853-866, fig. 1).—Two areas of Houston black clay, one of which had virgin prairie cover and the other cultivated and cropped to cotton, were investigated to determine a usable index of infiltration by using the method of Musgrave (*E. S. R.*, 73, p. 446). The infiltration rate as determined for individual soil cylinders varies within wide limits. This variation can be attributed to differences in the permeability of the soil. Earthworm activity was also found to affect infiltration greatly. There is a difference in the rate and the change in rate of infiltration with time directly attributable to soil and experimental conditions. Mechanical analyses, moisture equivalents, volume weights, soil moisture content, and pore space were investigated to obtain information on differences in infiltration, and correlations between several other factors were established.

The influence of temperature on the permeability of soils to water, Y. GUSTAFSSON (Lantbr. Högsk. Ann. [Uppsala], 8 (1940), pp. 425-456, figs. 15; *Swed. abs.*, pp. 455, 456).—Determinations of the permeability of a soil, whether by field or laboratory studies, should be reduced to a fixed temperature in order to become commensurable.

Publications containing information on soil moisture and soil erosion, issued as a result of cooperative investigations by the Division of Dry Land Agriculture of the Bureau of Plant Industry and State agricultural experiment stations, J. S. COLE (*U. S. Dept. Agr., Bur. Plant Indus.*, [1940],

pp. 14).—The annotated bibliography on soil moisture lists 39 titles and that on soil erosion and its control 34 titles.

Soil and water conservation investigations, 1936-1939.—Progress report, C. E. SEITZ. (Coop. U. S. D. A. et al.). (*Virginia Sta. Multig. Rpt. 1* (1940), pp. [7]+54, figs. 39).—The report is of a preliminary nature, dealing with a description of the problem and the studies in operation with the methods being used. The results will be applicable to the limestone valleys and upland region of Virginia, and with adaptations should be of some value to the entire limestone valley extending from Pennsylvania to Alabama.

The effect of climatic factors and physical and chemical soil properties on erosion are under investigation with rotation control plots, watersheds, and through the use of artificial rainfall. Equations are presented for determining the relationship between soil and water losses and the degree of slope for corn and for wheat. Equations are also developed for relation of density of flow and degree of slope. Artificial rainfall studies indicated that 5-min. applications of rainfall at an intensity of 6.6 in. per hour after fertilization cause twice the phosphorus loss of an application of 3.3 in. of rainfall over a 20-min. period. Superphosphate applications increased plant growth and soil organic matter and brought about a better degree of aggregation in the 0- to 2-in. depth. Pasture contour furrows gave a higher soil moisture content in the A and B horizons than was found under check areas.

Details on the physical instillation are illustrated by photographs. Rainfall records, including intensity and frequency as well as data from the individual studies, are presented in appended tables.

Soil conservation (*New York State Sta. Rpt. 1940, p. 31*).—Four years' records from cooperative studies with the U. S. D. A. Soil Conservation Service on soil- and water-loss measurements in vineyards at Hammondsport are considered in relation to total annual precipitation.

Physico-chemical behavior of soil bacteria in relation to the soil colloid, T. M. McCALLA. (Kans. Expt. Sta.). (*Jour. Bact., 40* (1940), No. 1, pp. 33-43, figs. 2).—The importance of colloidal clay in the mineral nutrition of plants is reviewed. The relationship of adsorbed ions to the nature of the clay is considered. A comparison is made between bacteria and colloidal clay to bring out the fact that bacteria adsorb cations. Colloidal clay was found to stimulate the growth of bacteria. The order of cation adsorption is as follows: $\text{Na} < \text{NH}_4 < \text{K} < \text{Mg} < \text{Ca} < \text{Ba} < \text{Mn} < \text{Al} < \text{Fe} < \text{H}$. It is suggested that soil bacteria obtain their mineral needs by contact exchange of adsorbed ions between the bacterium and clay particles.

The microflora in the soil and in the run-off from the soil, J. K. WILSON and H. J. SCHUBERT. (Cornell Univ.). (*Jour. Amer. Soc. Agron., 32* (1940), No. 11, pp. 833-841).—Samples of soil and run-off material were collected at the U. S. D. A. Soil Conservation Experiment Station at the Arnot Forest near Ithaca, N. Y., to determine the extent to which certain physiological groups of the micro-organism population of the soil are carried away in run-off. From agar plate counts of the run-off and from a determination of the organisms in the soil in situ it was found that there were in several instances 180 to 400 times as many organisms in the run-off for each gram of solid material as there were in the soil from which the run-off came. Fertilizers did not affect the number of organisms in the sample of the original soil or in the run-off obtained from the soil.

Studies on Azotobacter (*Colorado Sta. Rpt. 1940, p. 39*).—The finding for the first time in Colorado soils of *A. vinelandii* in a soil incubated with sodium benzoate is noted.

The decomposition of the organic compounds in barnyard manure, N. BENGTSSON and C. BÄRTHEL (*Lantbr. Högsk. Ann. [Uppsala]*, 8 (1940), pp. 55-69, figs. 4; *Swed. abs.*, p. 68).—A study of the decomposition of cow manure at pH values of 6 and 8 revealed that after 4 yr. 100 percent of the cellulose, 92 of the pentosans, 61 of the lignin, and 45 percent of the proteins were decomposed in the alkaline samples. For the acid samples the figures were 85, 71, 28, and 22 percent, respectively.

Soil organic matter and nitrogen as influenced by green manure crop management on Norfolk coarse sand, N. McKAIS, JR., W. A. CARNS, and A. B. BOWEN. (U. S. D. A. and S. C. Expt. Sta.), (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 11, pp. 842-852, figs. 5).—Results are reported from field and lysimeter studies on the effect of different crop management practices on the carbon and nitrogen content of Norfolk coarse sand. Soybeans and velvetbeans used as green manures in a 3-yr. rotation of legumes, corn, and cotton were similar in their effects. Soil from cowpea plats was a little lower in nitrogen and had a higher carbon:nitrogen ratio. A summer green manure crop followed by a winter cover crop of rye maintained the soil carbon and nitrogen at a higher level than a summer cover crop with winter fallow management. Maximum benefits from green manuring are obtained by storing organic legume matter with its contained nutrients during the soil improvement period and then releasing the nutrients by decomposition of the organic matter at the time when the nutrients will be of most benefit to the following crop.

Plant tissue tests may be valuable aid to farmers, C. B. SAYRE (*Farm Res. [New York State Sta.]*, 7 (1941), No. 1, pp. 11, 14).—Tissue tests of growing plants have been found useful for supplying accurate information on soil deficiencies and thus make it possible to diagnose the difficulty and assist the farmer in applying the proper fertilizer. Tissue tests are more valuable than soil analysis, since the latter gives no information on the availability of nutrients for plant use. The tissue test is referred to as a "trouble shooter" because it enables one to determine what is wrong with the soil and to determine the effectiveness of a particular fertilizer treatment.

A general deficiency of phosphorus was found through plant-tissue tests of tomato fields made during 1940. The method of application of the fertilizer is very important in determining phosphorus availability because phosphorus that is applied to the surface becomes fixed in the upper 2 or 3 in. of soil. The importance of a physiological balance of nutrients in the plant was brought out in field tests on tomatoes receiving heavy applications of phosphorus and potash. The plants under these heavy fertilizer treatments showed nitrogen starvation, and yields were not increased until nitrogen was supplied. Reasonably accurate tests for nitrogen, phosphorus, and potash can be made with a small kit in the field. However, tests for calcium, magnesium, manganese, iron, and aluminum must be made in the laboratory. While tissue tests are very helpful, it is pointed out that skill is required in the analysis and interpretation of the results.

Organic carbon, pH, and aggregation of the soil of the Morrow plats as affected by type of cropping and manurial addition, R. S. STAUFFER, R. J. MUCKENHURN, and R. T. ODELL. (Ill. Expt. Sta.), (*Jour. Amer. Soc. Agron.*, 33 (1940), No. 11, pp. 819-832, figs. 3).—The effect of cropping systems under way since 1904 on the Morrow plats is reported from a study of pH, aggregate analysis, volume weight, mechanical analysis, and total carbon. The cropping systems included continuous corn, a corn-oats rotation, and a corn-oats-clover rotation, with and without manure, lime, and rock phosphate. Plats in continuous corn were poorly aggregated at the surface, but showed an increased aggregation with depth which is explained as being due to erosion and not to the corn, since the

B horizon is 6 to 9 in. nearer the surface under the corn plats. It was thus estimated that erosion had removed about 6 in. of soil, or about 0.1 in. annually since the plats were originally established. Taking into consideration soil losses of this magnitude under continuous corn it is difficult to make comparisons with other treatments. The limed plats were higher in pH than unlimed plats from 0 to 9 in. but were not greatly affected below 9 in. The unfertilized continuous corn plat was lowest in total carbon to a depth of 13 in., while the fertilized corn-oats-clover plat was highest to 9 in. A corn-oats rotation receiving fertilizer was not materially better in maintaining soil organic matter than was continuous corn with fertilizer. A bluegrass sod border under continuous cover for 34 yr. was no higher in total carbon than the fertilized corn-oats-clover plat.

Effects of rotational and manurial treatments for twenty years on the organic matter, nitrogen, and phosphorus contents of Clarion and Webster soils, W. J. PEEVY, F. B. SMITH, and P. EL BROWN. (Iowa Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 10, pp. 739-753, fig. 1).—Changes in organic matter, nitrogen, and total phosphorus content of Clarion and Webster soils from 1917 to 1937 from 2-, 3-, and 5-yr. rotation experiments are reported. Losses in total phosphorus were, in general, insignificant. Soils treated with rock phosphate showed significant increases in phosphorus content. The greatest losses of organic matter and nitrogen occurred with the 2-yr. rotation. The loss of organic matter and nitrogen was much less where manure was applied than where crop residues were returned to the soil. The authors report a significant correlation between the original soil organic matter and nitrogen and their losses, that is, the higher the original contents the greater the loss.

Proceedings of the fifteenth annual meeting of the National Joint Committee on Fertilizer Application, held at New Orleans, Louisiana, November 21, 1939 (*Natl. Joint Com. Fert. Appl. Proc.*, 15 (1939), pp. [3]+153, figs. 3).—Reports of progress from 16 States on methods of fertilizer application for various crops are presented.

The influence of placement upon the movement of fertilizer salts in the soil, J. M. BLUM, M. M. PARKER, and EL. R. PURVIS. (Va. Truck Expt. Sta.). (*Amer. Fert.*, 93 (1940), No. 13, pp. 8, 9, 24, 26, fig. 1).—The movement of fertilizer salts was followed by conductivity tests of soluble salts obtained from water extracts of soil taken at various intervals from unfertilized plats, plats fertilized by hand in a 12-in. strip in the row and worked into the soil immediately before planting, and from areas fertilized in bands 2 in. to each side and 2 in. below seed level at time of planting. The band treatment was made with a revolving cylinder top delivery fertilizer distributor attached to the planter. Soluble salts in the soil were determined 5, 19, 35, and 53 days after planting in the plant row 0, 2, 7, and 14 in. away from the plants. Salt concentration for the "in row" fertilizer placement remained high throughout the period of study. No germination or plant injury was evident, but this treatment produced only 80 percent as many snap beans as the band method of fertilizer application. Under the band treatment the high concentration of soluble salts remained in the band during the germination and early growth period and thus was not harmful to germination or early growth. Unfertilized areas showed a general low level of fertility and produced only 60 percent as many beans as the band fertilizer treatment.

The effect of soil characteristics and winter legumes on the leaching of potassium below the 8-inch depth in some Alabama soils, N. J. VOLK. (Ala. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 11, pp. 888-890).—Representing 8 different soil types, 210 plats were sampled at from 0- to 8-, 8- to 16-, and 16- to 24-in. depths and analyzed for soluble and replaceable potash.

Soil texture and the type of plants grown were found to have a large effect on the potassium leached downward. Winter legumes were effective in reducing the leaching of potassium, the saving amounting to 17 percent of the total potassium applied, and thus, in addition to preventing erosion and supplying nitrogen for the succeeding crops, being valuable from the standpoint of conserving soil potassium.

"Milorganite" as a source of minor nutrient elements for plants, C. J. REHLING and E. TRUOG. (Wis. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 11, pp. 894-906, figs. 2).—Dried activated sludge sold under the trade name of milorganite was shown in earlier work (E. S. R., 82, p. 451) to contain 0.0115 percent B_2O_3 , 0.0431 percent CuO, 0.0250 percent MnO, and 0.080 percent ZnO. In order to test the availability of these nutrients, culture solutions were set up to some of which were added a carbonic acid extract of milorganite to serve as the only source of these minor elements. Corn, sunflower, and tomato plants were grown and analyzed for each of the various elements. It is concluded that milorganite when used as a fertilizer or as a part of mixed fertilizer may serve as a source of minor nutrient elements required for plant growth.

Production and agricultural use of ammonium sulfate, C. C. FLETCHER, A. R. MERZ, and B. E. BROWN (*U. S. Dept. Agr. Cir.* 578 (1940), pp. 15).—This is a more or less popular summary of sources, production figures, fertilizer properties, and uses of ammonium sulfate, together with home-mixing formulas and composting procedures.

Commercial fertilizers report for 1940, E. M. BAILEY (*Connecticut [New Haven] Sta. Bul.* 441 (1940), pp. 60).—An explanation of the fertilizer law and regulations concerning fertilizers in Connecticut is presented, together with the usual analyses. The registrations for inspection for 1940 amounted to 64 firms and individuals, including 344 brands of fertilizer registered for sale in the State.

Inspection and analysis of commercial fertilizers, B. D. CLOANINGER (*South Carolina Sta. Bul.* 330 (1940), pp. 163, figs. 6).—The provisions of a new fertilizer law which became effective August 1, 1939, are outlined. The new law is on the same basis as in adjoining States and has been helpful in avoiding confusion by farmers near the State's borders.

Recommended fertilizer analyses and rates of application are given for various crops grown in South Carolina. Analyses of 5,026 samples are tabulated.

AGRICULTURAL BOTANY

Abstracts of the papers presented before the Pacific section of the Botanical Society of America, Seattle, Washington, June 17 to 22, 1940 (*Amer. Jour. Bot.*, 27 (1940), No. 8, pp. 705-709).—The following are included: Vascular Differentiation in the Shoot Apex of *Sequoia*, by A. S. Crafts (p. 705), and The Structure of the Shoot Apex of *Opuntia cylindrica* and *Trichocereus spachianus*, by N. Boke (pp. 705, 706) (both Univ. Calif.); The Development of the Seed of *Lycopersicon esculentum* Mill., with Special Reference to the Differentiation of the Seed Coat, by A. J. Brown (p. 706) (Oreg. State Col.); Are Genera Natural Units? by C. L. Hitchcock (p. 706); Some Factors Influencing Speciation in the Genus *Calochortus*, by M. Ownbey (p. 706) (Wash. State Col.); Major Plant Communities on a Transect Through Western Oregon, by L. E. DeTling (p. 706); A One-Year Record of Soil and Air Temperature in a Salt Marsh, by G. B. Rigg and L. D. Phifer (pp. 706, 707); Cell Size in Developing *Iris* Ovaries, by H. P. Riley and D. Morrow (p. 707); Origin and Development of the Carpel in *Lathyrus odoratus*, by A. R. Spurr (p. 707)

(Univ. Calif.); The Caryophyllaceous Flower—A Study in Floral Morphology, by F. G. Meyer (p. 707) (Wash. State Col.); A Chaparral Association of Northern Baja California, by C. Epling and H. Lewis (p. 707), Phytogeography of American Scirpi, by A. A. Beetle (pp. 707, 708), and The Taxonomy and Geographical Distribution of the Genus *Leptotaenia*, by M. E. Mathias and L. Constance (p. 708) (all Univ. Calif.); and Sexual Hormones in the Thallophytes, by J. Raper (p. 708).

[Abstracts of papers presented at National Academy of Sciences meeting] (*Science*, 92 (1940), No. 2393, pp. 415, 416).—The following are of interest to botany: Physiological Differentiation of *Astragalus* in Response to Selenium, by S. F. Trelease; Sensitivity of *Gladiolus* Corms During an Artificially Prolonged Rest Period, by F. E. Denny; Growth of Excised Roots and Heterosis in Tomato, by W. J. Robbins; Theoretical and Experimental Studies on Protoplasmic Streaming, by W. Seifriz and N. Kamiya; and Formation of Crystalline Cellulose in Plastids of Living Cells, by W. K. Farr.

Indices, The Botanical Review, Volumes I–V, 1935–1939 (*Bot. Rev. Indices*, 1–5 (1935–39), pp. 124).—Indexes to articles, subject matter, and authors are included.

John and William Bartram: Botanists and explorers, 1699–1777, 1739–1823, E. EARNEST (*Philadelphia: Univ. Pa. Press*, 1940, pp. VII+187, pls. 2).—This book is not only of biographical interest, but presents much of historical value for early botany and explorations in America.

A method for determining and specifying locality by collectors, C. F. REED (*Science*, 93 (1941), No. 2403, p. 68).—A system for plant collectors, using the quadrangle topographical maps published by the U. S. Geological Survey (or similar maps) and numbering the nine primary divisions of each quadrangle with the decimal figures 0.1 to 0.9. A transparent celluloid overlay is cut the size of an average primary division for the area to be studied and divided into nine secondary divisions numbered 0.01 to 0.09. In the same way, each secondary and tertiary division is further subdivided and numbered, respectively, 0.001 to 0.009, and 0.0001 to 0.0009. By placing the overlay on any one of the primary rectangular divisions of the map, any point on the division can be estimated as a 4-point decimal, and a fifth can be estimated. Since each quadrangle bears a name, this name precedes the code in specifying locations, as, e. g., "Ellicott 0.99887." For field use each map is cut into its nine primary divisions, which are pasted into a loose-leaf notebook.

Additions to the mycological flora of Venezuela [trans. title], C. E. CHARDON (*Bol. Soc. Venez. Cien. Nat.*, No. 40 (1939), pp. [1]+34, pls. 3).—This contribution supplements one previously referred to (*E. S. R.*, 72, p. 460), presenting pertinent data on various fungi of the Phycomycetes, Discomycetes, and Pyrenomycetes and including many new species.

List of Pyrenomycetes recorded for Britain, G. R. BISBY and E. W. MASON (*Brit. Mycol. Soc. Trans.*, 24 (1940), pt. 2, pp. 127–243).—An annotated list, with 117 references and an index to genera and species.

New data on the life histories of Ascomycetes [trans. title], E. GÄUMANN (*Ztschr. Bot.*, 35 (1940), No. 11–12, pp. 433–513, figs. 34).—A comprehensive analytical review (7-page bibliography).

Genera of cultivated plants represented in the indigenous flora of Argentina [trans. title], L. R. PARODI and A. I. PASTORE (*Physia*, 18 (1939), No. 50, pp. 255–268).—A copiously annotated conspectus.

Botany of the Canadian Eastern Arctic.—I, Pteridophyta and Spermatophyta, N. POLUNIN (*Canada Dept. Mines and Resources, Natl. Mus. Canada*

Bul. 92 (1940), pp. 1-408, figs. 9, map 1.—This monographic manual briefly considers the history and exploration of the region and discusses the general factors in the vascular plant flora before presenting the detailed data for individual species and varieties. New taxonomy is included, and an index to Latin binomials and a general bibliography of over 11 pages are provided.

Illustrated flora of the Pacific States—Washington, Oregon, and California.—I, Ophioglossaceae to Aristolochiaceae—ferns to birthworts, L. ABBAMS (*Stanford University, Calif.: Stanford Univ. Press; London: Oxford Univ. Press, 1940, vol. 1, pp. IX+538, figs. 1299*).

Alien plants growing without cultivation in California, W. W. ROBBINS (*California Sta. Bul. 637 (1940), pp. 128*).—The introduction and migration of species, the agencies concerned, the behavior of the migrants in their new environment and their influence upon it, the interaction between them and the native species, and their effect on agriculture are considered in this contribution. Lists of important species established in California by 1860 and those introduced between 1860 and 1900 and since 1900 are included, and the detailed data on individual species—the bulk of the text—are arranged by plant families. A 7½-page bibliography and an index of common and scientific plant names are provided.

Vegetation type maps of California and western Nevada, H. A. JENSEN. (U. S. D. A. coop. Univ. Calif.). (*Science, 92 (1940), No. 2389, p. 333*).—A description is given of these maps, prepared by the California Forest and Range Experiment Station. Of these 21 units were already available, showing the vegetational resources of the areas covered, superimposed in color and symbol on standard U. S. Geological Survey topographic quadrangle maps. Included on the wide margins are brief descriptions of the basic vegetational type classifications, summaries of type areas, and a profile illustrating the relationship of types to elevation and slope exposure. Plant associations, based upon dominant species composition, comprise the primary vegetational elements mapped. These are shown in their actual relation to the topography, with symbols identifying the species involved. These maps can be utilized in many projects dealing with protection, management, and utilization of vegetational resources and are valuable for instructional purposes.

Relic prairie areas in central Wisconsin, J. W. THOMSON, JR. (*Ecol. Monog., 10 (1940), No. 4, pp. 685-717, figs. 25*).—Observations on the geology, physiography, soils, climate, and prairie relics of the area are presented, with a page of references. The historical evidence and the presence of relic communities of prairie plants indicate that the prairie in Wisconsin once had a much wider range. Portions of these relic communities have been destroyed by cultivation, but portions of others remain and are still being invaded by the forest. Some of the prairie plants are spreading from the relic communities to the sandy soils of central Wisconsin, this spread all being on areas disturbed by human activities, such as abandoned fields and railroad rights-of-way. The succession on such places is from weed flora to prairie plants, which reach a maximum in about 15 yr. and finally decline. Then the forest, represented by jack pine and aspen and later also oak, supersedes the prairie plants.

The grassland biome, J. R. CARPENTER (*Ecol. Monog., 10 (1940), No. 4, pp. 617-684, figs. 7*).—Climax grassland communities occur on all the world's major land masses and are said to possess marked resemblance and consistency in climates, floral and faunal types, growth form, physiognomy, and in more characteristics of the component biota. The purpose of this monographic account (over 11 pages of references) was to bring together the results of research and reports on the condition, fauna, flora, and interrelationships as they existed in the North

American grassland before settlement by the European races, in the hope that a better understanding may be had of the best ways in which the region surveyed may be utilized. The text considers the climate of the grassland, the tall-grass prairie, mixed-grass prairie-plains, short-grass plains, edaphic woodland inclusions in the grassland, and the ecology of the grassland biome.

Plant sociological methods [trans. title], M. SCHWICKERATH (*Ber. Deut. Bot. Gesell.*, 58 (1940), No. 5, pp. 237-249).—A general discussion and review (12 references) of the subject.

The development of sphagnum bogs in North America, G. B. RICE (*Bot. Rev.*, 6 (1940), No. 12, pp. 666-698).—A comprehensive review (89 references).

Problems of lake biology, edited by F. R. MOULTON (*Lancaster, Pa.: Science Press, 1939, pp. 142, figs. [43]*).—Following the foreword, by F. R. Moulton, this symposium includes the following papers: Some Physical and Chemical Factors in the Metabolism of Lakes, by D. S. Rawson (pp. 9-26); The Utilization of Solar Energy by Aquatic Organisms, by G. L. Clarke (pp. 27-38); The Distribution of Bacteria in Lakes, by A. T. Henrici (pp. 39-64) (*Univ. Minn.*); Some Relationships of Phytoplankton to Limnology and Aquatic Biology, by G. W. Prescott (pp. 65-78); The Zooplankton in Relation to the Metabolism of Lakes, by W. L. Tressler (pp. 79-93); The Microscopic Fauna of the Sandy Beaches, by R. W. Pennak (pp. 94-106); Rooted Aquatic Plants and Their Relation to the Limnology of Fresh-Water Lakes, by L. R. Wilson (pp. 107-122); Role of the Bottom Fauna in the Productivity of Lakes, by F. E. Eggleton (pp. 123-131); and The Position of Fish and Other Higher Animals in the Economy of Lakes, by F. E. J. Fry (pp. 132-142).

Investigations as to the absorption and accumulation of inorganic ions, H. LUNDEGÅRDH (*Lantbr. Högsk. Ann. [Uppsala]*, 8 (1940), pp. 283-404, figs. 37).—A comprehensive review with 219 references and results of experimental work on the interaction of aerobic respiration of roots and the electrochemical behavior of the surface of the protoplasm.

The absorption of bicarbonate ion by barley plants as indicated by studies with radioactive carbon, R. OVERSTREET, S. RUBEN, and T. C. BROYER. (*Calif. Expt. Sta. and Univ.*). (*Natl. Acad. Sci. Proc.*, 26 (1940), No. 12, pp. 688-695).—In the experiments detailed, radioactive carbon, present in the culture solution largely as HCO_3^- ion, was definitely assimilated by the plant roots. Under the conditions imposed, 4-5 percent of the originally available radiocarbon was retained by the tissue, and chemical examination revealed that the absorbed C^* was present chiefly as reduced carbon. The results obtained speak for the independent retention of cations by plant roots, a fact lending support to the exchange absorption theory. It is emphasized, however, that this conclusion applies to the net result of the accumulation reaction which presumably takes place in the cell protoplasm, and the experimental results in no way preclude the possibility that K^+ and HCO_3^- may penetrate the root cell as far as the protoplasmic surface in chemically equivalent amounts.

The significance of trace elements for *Chlorella* [trans. title], G. STEGMANN (*Ztschr. Bot.*, 35 (1940), No. 10, pp. 385-422, figs. 18).—This study concerned the growth of *C. vulgaris pyrenoidosa* in highly purified nutrient solutions in quartz flasks under deficiencies in N, P, S, K, Na, Ca, Mg, Mn, and Fe.

Electro-foliar diagnosis, C. H. SPURWAY. (*Mich. State Col.*). (*Science*, 92 (1940), No. 2395, pp. 489, 490, fig. 1).—A preliminary report on the use of a suitable form of the well-known electrolysis apparatus for qualitative or semi-quantitative spot tests for mineral elements (e. g., Fe and Mn, as studied in relation to their role in chlorosis) by electrolyzing the leaf tissue and catching the removable ions in chemically treated filter papers.

Studies on the nutrition of fungi.—V. Factors affecting zygospore formation in *Phycomyces blakesleeanus*, L. H. LEONIAN and V. G. LILLY. (W. Va. Expt. Sta.). (*Amer. Jour. Bot.*, 27 (1940), No. 8, pp. 670–675, figs. 4).—Continuing the series (*El. S. R.*, 83, p. 38), filter paper was substituted for agar to facilitate transferring the cultures, and a synthetic medium containing only well-known and highly purified substances was used to saturate it. When inoculated with plus and minus strains of *P. blakesleeanus*, a large number of zygospores developed. High concentrations of thiamin, dextrose, and aspartic acid proved unnecessary for zygospore production. A vigorously growing colony of plus and minus strains, when washed and transferred to solutions of any one of the food constituents, failed to produce very many zygospores; thiamin was no more effective than distilled water. The constant presence of complete food is thus necessary for maximum zygospore production. No single substance tested proved to be a sexuality-promoting substance for this fungus.

The chemistry of the fungi, A. E. OXFORD. (Univ. Wis.). (*Chron. Bot.*, 6 (1941), No. 8, pp. 177, 178).—A review and general discussion.

Solar rays and vitamin C, E. F. KOHMAN and D. R. PORTER (*Science*, 92 (1940), No. 2398, p. 561, fig. 1).—Since there was a rapid loss of ascorbic acid in growing tomato plants when kept in the laboratory overnight and a rapid recovery when exposed to direct sunlight, and since there was evidence of a positive correlation between ascorbic acid and sugar in the ripe fruit, the question is posed as to whether it is not possible that ascorbic acid may be a step in the formation of carbohydrates.

Coleoptile growth after preliminary soaking of oat grains in various solutions, H. G. ALBAUM, S. KAISER, and B. EICHEL (*Amer. Jour. Bot.*, 27 (1940), No. 8, pp. 619–623, figs. 5).—In coleoptiles of oats grains soaked 24 hr. at room temperature in solutions of glucose and 3-indoleacetic acid, early growth was retarded and the final length increased. Regardless of treatment, final length was always a function of *K*, a velocity index in the growth equation, the two being inversely related. The respiration rate of grains immediately after soaking was inversely related to the final length of coleoptiles and hence directly to the growth rate. Growth was also related to the O_2 content of the soaking medium. It is concluded that the coleoptile growth thus treated depends largely on the O_2 content of the soaking medium, which determines in part early respiratory activity. This in turn affects the early growth rate, and thus the final length attained. Under the conditions imposed, the lower the O_2 content of the soaking fluid the slower is the growth rate, the longer the growth period, and the larger the final length of the coleoptile. The relationships described were found to hold when gas mixtures containing 2.5–20 percent O_2 were used.

Growth substances in a hybrid corn and its parents, W. J. ROBBINS (*Bul. Torrey Bot. Club*, 67 (1940), No. 7, pp. 565–574, figs. 4).—The effects of extracts of partially germinated seed of a hybrid corn and its inbred parents was determined on the growth of *Phycomyces* with and without thiamin and on that of *Ashbya gossypii* without biotin. Extracts from the hybrid had a greater effect on early growth of *Phycomyces* in the presence of thiamin than had those of either parent, but extracts of the hybrid did not have a greater effect on *Phycomyces* in the absence of thiamin or on *Ashbya* in the absence of biotin. The possible relation of these findings to heterosis is briefly discussed.

The growth effects of thiamin chloride, ascorbic acid, and phytohormones on belladonna and Ricinus, L. C. ZOFF (*Jour. Amer. Pharm. Assoc.*, 29 (1940), No. 11, pp. 487–497, figs. 10).—Dust treatments of seed with hormone and hormone plus vitamins B₁ and C influenced both germination and growth of *Atropa belladonna* and *R. communis*, varying with the concentration and with

the species and age of plant. α -Naphthaleneacetic acid applied in solution in toxic doses induced varying responses in different plants, the toxic threshold varying with type of plant. Simultaneous use of vitamins B₁ and C exhibited an antitoxic or antidoting property toward plants previously subjected to toxic doses of the hormones used. This reaction was not ascribable to a neutralizing effect or chemical combination between the α -naphthaleneacetic acid and the vitamins. The antitoxic quality of concurrent administration of the water-soluble vitamins B₁ and C was also of value in delaying and reducing the degree of epinastic responses of belladonnas about to bloom. Photosensitizer in aqueous solution added directly to the soil of plants containing both vitamins B₁ and C increased their top growth.

On the growth factor requirements of isolated roots, J. BONNER (*Amer. Jour. Bot.*, 27 (1940), No. 8, pp. 692-701, fig. 1).—Culture of isolated roots in synthetic media is described with particular reference to organic growth substance requirements. Alfalfa, clover, and cotton were found to require additions of vitamin B₁ and nicotinic acid for luxuriant growth in vitro, but vitamin B₆ was without further growth-promotive effect. Isolated roots of *Datura stramonium* and sunflower required additions of vitamin B₁, B₆, and nicotinic acid for luxuriant in vitro growth, whereas carrot required vitamins B₁ and B₆, but nicotinic acid gave no further growth-promotive effect. Five strains of isolated tomato roots from three widely separated sources were successfully cultured in media containing vitamins B₁ and B₆, but nicotinic acid further increased their growth rates. Isolated roots of flax and clover, which can grow slowly in the absence of external supplies of vitamin B₁, were shown to synthesize small amounts of it during in vitro culture. Isolated roots may synthesize biotin during in vitro culture.

The cause of decreased germination of bean seeds soaked in water, H. C. EYSTER (*Amer. Jour. Bot.*, 27 (1940), No. 8, pp. 652-659).—Bean seeds soaked in water for several hours showed a decrease in germination that was significantly influenced by the temperature of the water in which they had been soaked. The germination of stringless green pod bush bean seeds soaked in water at about 25° C. was much less seriously reduced than in those soaked at either higher or lower temperatures. Bacterial activity is an important factor but not the sole cause for these decreases in germinability, as shown by the facts that (1) the soaking process is more deleterious at 10° than at 25°, at which temperature the bacteria are more active, (2) bean seeds placed in running water at 13° for 3 days did not differ in germinability from those soaked in stagnant water at 13° for 3 days, and (3) sterilized seeds soaked in sterile water exhibited a reduction in germinability. That bacteria do, however, reduce germinability was shown by the results with bean seeds soaked without regard to sterilization of both seeds and water. Chemical analyses of the water in which the seeds had been soaked indicated that there is a loss of proteins, digestive enzymes, and growth substances, and that the resulting germinability of the seeds is approximately inversely proportional to this loss. It is believed that alterations in the normal differential permeability of cell membranes in the seeds are the basic cause of the decrease in germinability here reported.

Preliminary observations on physiological and cytological effects of certain hydrocarbons on plant tissues, R. L. PATTON and B. R. NEBEL. (N. Y. State Expt. Sta.). (*Amer. Jour. Bot.*, 27 (1940), No. 8, pp. 609-613, figs. 2).—Treated roots of a purebred strain of corn grown in vitro showed a general lowering of rates of elongation, respiration, and dipeptidase activity of tissue extracts as compared to untreated controls. Methylcholanthrene proved more

active than 1,2,5,6-dibenzanthracene which was more active than acenaphthene, and anthracene appeared to have no effect. Colchicine was not strictly comparable with the other substances used on account of its high water solubility. Methylcholanthrene crystals inserted into stems of *Tradescantia reflexa* tended to increase the volume of the chromosomes in the first division of the pollen grain. Methylcholanthrene added to the water over which onion roots were sprouted increased the diameter of nuclei as observed in sectioned material. If root tips were removed during treatment, methylcholanthrene enhanced the formation but not the growth of lateral root initials. In excised corn roots, methylcholanthrene and dibenzanthracene increased the diameter of prophase nuclei. Acenaphthene increased the diameter of resting diploid nuclei. Colchicine increased the diameter of nuclei only in concentrations high enough to cause polyploidy.

Experimental studies on the cultivation of excised anthers in nutrient solution. W. C. GREGORY (*Amer. Jour. Bot.*, 27 (1940), No. 8, pp. 687-692, figs. 16).—Anthers of Easter lily, tomato, and *Datura stramonium* were excised aseptically and grown in vitro to determine the effects of such isolation on meiosis when they were excised at different stages of development. The young lily anthers grew in nutrient solution except early in meiosis, where the sporogenous cells failed in several ways, depending on the developmental stage of the anthers when excised. Similar reactions were obtained in entire excised buds containing young anthers. Lily anthers excised as late as diplotene continued their meiotic divisions to the formation of quartets. Anthers of tomato and *Datura* failed to grow in nutrient solution. Cutting the flower stems of tomato before meiosis in the buds had an effect on anther development similar to excision of the anther for in vitro culture. Cutting such stems after meiosis in buds only slightly larger than the preceding had no effect on anther or flower development. Furthermore, in a single grafted cutting of tomato on an uninjured stock normal flowering occurred, whereas it failed on similar nongrafted cuttings. The results suggest that control of the chromosomes at meiosis is not vested entirely in the cells actually undergoing the divisions, but results from interactions involving one or more necessary materials which are transported into the anthers from another part of the plant.

A division of the alfalfa cross-inoculation group correlating efficiency in nitrogen fixation with source of *Rhizobium meliloti*. J. C. BURTON and L. W. ERDMAN (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 6, pp. 439-450, figs. 11).—Nitrogen-fixation studies of strains of *R. meliloti* on alfalfa, bur-clover, sweet-clover, and fenugreek indicated that those isolated from alfalfa or sweetclover caused no significant fixation in bur-clover or fenugreek, whereas those from bur-clover or fenugreek gave an average percentage effective in all four hosts. It is concluded that the *Rhizobia* associated with alfalfa and sweetclover lose some component not necessary for high nitrogen fixation on these legumes but which is very essential for it in bur-clover and fenugreek. The nodule-forming capacity of the bacteria is not altered by association with any of the legumes studied.

Studies on photosynthesis: Some effects of light of high intensity on *Chlorella*. J. MYERS and G. O. BURR. (Univ. Minn. et al.). (*Jour. Gen. Physiol.*, 24 (1940), No. 1, pp. 45-67, figs. 15).—Using the Warburg technic, the effect on oxygen evolution of *C. vulgaris* produced by light intensities up to about 40,000 footcandles was studied. Above a certain critical intensity, determined by the previous history of the cells, the rate of O_2 evolution decreased from the maximum to another constant rate, this depression at first being completely reversible. With a sufficiently high intensity this constant

rate represents an O_2 uptake greater than the rate of dark respiration, and during this constant rate a progressive injury to the photosynthetic mechanism occurs. After a given O_2 consumption the rate falls off, approaching zero, and the cells are irreversibly injured. The constant rate of O_2 evolution decreases in a continuous manner with increasing light intensities, approaching a value approximately constant for all lots of cells regardless of previous history. Theoretical explanations are presented. In *C. vulgaris*, solarization is influenced by the previous history of the cells.

The control of protoplasmic streaming, N. KAMIYA (*Science*, 92 (1940), No. 2394, pp. 462, 463, fig. 1).—Description of a method successfully used with slime-mold plasmodia and said to be adapted to analyses of protoplasmic rhythm and to such problems as that of the relative influences of motive force and viscosity in protoplasmic flow. It also suggests a new method for measuring protoplasmic viscosity.

Influence of daily variation of temperature on development of plants, J. I. POTAPENKO and E. I. ZAKHAROVA (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 26 (1940), No. 3, pp. 278-282, figs. 2).—Investigating the photoperiodic and temperature relations of certain plants (*Malus buccata*, *Pyrus ussuriensis*, *Cerasus* (= *Prunus*) *bessnyi*, and tomato), it was noted that their photoperiodic requirement varied during the course of their development and that light was not always an inhibitor of growth. Some plants may have developed adaptations making it possible for them to grow more intensively on long or continuous illumination, whereas others, adapted to short days, make a stronger growth on continuous illumination because the nightly reduction of temperature favors it. When the temperature is kept at a high level by night, the plants grow very slowly whether on long or short day lengths. It is thus due to a decrease in temperature that growth is stronger by night than by day in certain plants.

Rôle of the temperature gradient in the ontogenesis of higher plants, S. I. RADCHENKO (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 26 (1940), No. 3, pp. 275-277).—Data presented led to the conclusion that during the period of embryonic development (at the expense of seed supplies) the plant depends exclusively on the temperature of the soil. Later on, when it has passed to an independent mode of nutrition, the plant requires a temperature gradient.

Effect of soil and air humidity and of the temperature of the air upon the formation of spikelets in the ear of wheat, E. G. MININA, E. V. IGRIKAJA, and P. P. MAZKEVICH (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 26 (1940), No. 3, pp. 271-274, fig. 1).—The authors conclude from their studies that a high moisture content of the soil and corresponding hydrothermal conditions of the air, as produced by spraying, are necessary conditions for increase in the number of spikelets per ear, this being the first step toward increases in yields. Comparisons of the reactions of the growing cone of summer wheat to external hydrothermal air conditions indicated that the phase of spikelet protuberance is more sensitive than earlier phases. Plants grown in soil at 80 percent moisture content are regarded as younger than those grown at 40 percent. Increased soil moisture, and consequently the lower air temperature, are regarded as factors which rejuvenate the organism.

Oxygen respiration in wheat grain in relation to freezable water, H. G. SHIRK and C. O. APPLEMAN. (*Md. Expt. Sta.*). (*Amer. Jour. Bot.*, 27 (1940), No. 8, pp. 613-619, figs. 7).—Using the Warburg manometer and mature wheat grain of different varieties, the respiration rate paralleled very closely the freezable water content in grains containing different amounts of imbibed

water in equilibrium with the tissues and colloids of the kernels. As the total water was increased, the unfreezable water calculated as percentage of total solids increased gradually until the grain had imbibed about 21 percent total water, beyond which the percentage of unfreezable water remained practically constant. Thus the ratio of freezable to unfreezable water increased as the grain continued to imbibe total water. The respiration rate correlated closely with the value of this ratio. It is concluded that the sharp acceleration of respiration rate in wheat grains when the total water is increased above a certain minimum is due to a rather sudden increase in the freezable water relative to the other constituents of the cell system. Studying the time rate of respiration in relation to freezable water during the period when a bound- and free-water equilibrium was being established after imbibition of different amounts of total water, the respiration rate decreased very rapidly during the first 5-7 hr. and then more slowly until a fairly constant rate was attained after 25-30 hr. This decline in respiration rate closely paralleled the decrease in freezable water. The total water of the grain remained practically constant throughout the experimental periods. The initial respiration rate and the rate of equilibrium was higher with each increase in total water. As the total water in the grain was increased, the downward drift, with time, of the respiration rate was more gradual but always attained a constant value within 25 hr. The greater the initial total water of the grain, the longer was the time required for establishing a free- and bound-water equilibrium.

Water content and osmotic pressure of certain prairie plants in relation to environment, F. L. MARSH (*Nebr. Univ. Studies*, 40 (1940), No. 3, pp. [3]+44, figs. 23).—In this thesis, water content and osmotic pressure of shoots of prairie plants were studied in both lowland and upland to discover the range of these quantities in plants of true prairie under normal environmental conditions. Relationships between these and the more important environmental factors were also determined and are discussed in detail.

Investigations of insecticidal plants: Physiological studies (*Puerto Rico Sta. Rpt.* 1939, pp. 71-85, figs. 14).—Progress reports are included covering a survey of resin- and starch-cell tissues in rotenone-bearing roots; studies of the effects of exhausting food reserves from rotenone-producing plants, particularly *Tephrosia* and *Derris*; and iron-deficiency chlorosis in sand cultures of *Derris* and fields of *Lonchocarpus*.

Double-staining of starch grains and plastids for permanent preparations, W. N. JONES (*Chron. Bot.*, 6 (1940), No. 7, p. 152).—A brief review of data on the use of methyl violet and Nile blue.

Structure and composition of plant cell membranes, W. K. FARE (*Nature [London]*, 146 (1940), No. 3692, pp. 153-155, figs. 2).—A review discussing the historical and modern conceptions and current observations of membrane composition.

The problem of plasmodesmata and inclusion in guard cells of virus-diseased plants, K. ESAU. (Univ. Calif.). (*Amer. Jour. Bot.*, 27 (1940), No. 8, p. 705).—An abstract.

The floral anatomy of the Kalanchoideae, A. H. TILLSON. (U. S. D. A.). (*Amer. Jour. Bot.*, 27 (1940), No. 8, pp. 595-600, figs. 20).—From this study of the floral anatomy of 33 species of the 3 genera comprising the subfamily Kalanchoideae, family Crassulaceae, the validity of the genera *Bryophyllum* and *Kitchingia* is said to be supported by the evidence obtained, but it was indicated that *Kalanchoe fedtschenkoi*, *K. gastonis-bonnieri*, and *K. waldehmi* are species of *Bryophyllum*.

Morphological studies of the pollen grains of common weeds of the Valley of Mexico [trans. title], M. AGUSTINA BATALLA (*Am. Inst. Biol. [Univ. Nac. Mex.]*, 11 (1940), No. 1, pp. 129-161, figs. 87; *Eng. abs.*, pp. 160, 161).—Plants in 24 families whose pollen is wind-disseminated, including also their systematic characters and flowering periods, are considered.

Double fertilization and development of the seed in angiosperms, R. A. BRINK and D. C. COOPER. (Wis. Expt. Sta.). (*Bot. Gaz.*, 102 (1940), No. 1, pp. 1-25, figs. 9).—Following self-pollination in alfalfa 34.4 percent of the fertile ovules collapsed during the first 144 hr., as compared with only 7.1 percent after cross-pollination. Fertile ovule collapse was associated with excessive growth of the inner integument, and this type of seed failure is attributed to inability of the endosperm to keep pace with the growth of surrounding tissues. Up to 6 days after pollination the number of cells in the embryo increased in arithmetical progression, and there was little difference in growth rate after self- and cross-pollination. In the endosperm the number of nuclei increased exponentially during this period, and its growth rate after hybridization was significantly higher than after self-fertilization. The number of endosperm nuclei associated with an embryo at a given developmental stage was regularly higher after cross-fertilization. A survey of 36 other species indicated that the angiosperm ovule is characteristically low in food reserves at fertilization, and early development of the seed thus depends on translocated foods. The endosperm is considered to play an essential role in the partition of these nutrients. The evidence on differential survival of seeds after self- v. cross-fertilization, growth of endosperm and embryo, histological changes associated with collapse, and comparative lack of ovule food reserves are discussed in relation to the role of double fertilization in seed formation. Conjugation of a male nucleus with the polar-fusion nucleus to form the primary endosperm nucleus is believed to be a mechanism by which the physiological advantages of hybridity become available to the endosperm. Continued seed development demands a rate of endosperm development attained more frequently after cross-fertilization by reason of heterosis than following self-fertilization. This view is believed to be confirmed by the behavior of alfalfa seeds following the two types of matings. There are 22 literature citations.

Polyembryony, J. M. WEBBER. (U. S. D. A.). (*Bot. Rev.*, 6 (1940), No. 11, pp. 575-598).—A comprehensive review (116 references) on the various types of polyembryony, frequency of polyembryony and developmental competition of plural embryos, causes of polyembryony, and its relations to phylogeny and to agriculture.

The aerial root primordia in the olive tree and their relation to vegetative propagation [trans. title], J. VIEIRA NATIVIDADE (*Agron. Lusitana*, 2 (1940), No. 1, pp. 25-73, figs. 15; *Fr., Eng. abs.*, pp. 64-70).—The excrescences ("ovuli") formed on the trunk or at the base of olive trees, used for centuries in propagation work, have hitherto been considered as formed of parenchymatous tissue, rich in nutrients and possessing dormant buds. The present study of several varieties indicated that these trunk tumors contain not only dormant buds but also a number of root initials arising in the immediate vicinity of the vascular cambium, whereas the buds originate in the inner layers of the phelloderm, close to the phloem. Contrary to literature statements, it is now demonstrated that the ovuli show a marked positive geotropism. At whatever level formed they grow toward the ground, forming cordlike growths down the trunk and burying themselves in the soil, where they root. Physiologically, these cords represent aerial roots. Accumulations of these cords, forming the

swollen hole typical of adult trees, gradually replace the parts destroyed by rotting processes, and it is to them that this species owes its longevity. It is shown that in grafted trees the appearance of these root-bearing swellings inevitably causes the scions to root, and that this root system insures the nutrition and fixation to the ground of trees of fruit-bearing age, the rootstocks acting merely as nurses until the scions have properly rooted. In place of the current use of rootstocks of slower growth than that of the cultivated varieties, it is deemed desirable to hasten the growth of the trees during their early years by selecting rootstocks of vigorous types and raising them vegetatively.

Contributions to the knowledge of the histology and cytology of the centuryplant, [I-III] [trans. title], F. VILLAGRAN PRADO (*Am. Inst. Biol. [Univ. Nac. Mex.], 10 (1939), No. 1-2, pp. 1-18, figs. 12, Eng. abs. p. 13; 11 (1940), No. 1, pp. 91-102, figs. 7, Eng. abs., pp. 101, 102*).—These contributions are as follows: In part 1 the author presents a study of the cytology of the chondriome and vacuome in cells of the connective tissue. Waxy droplets observed in the epidermal cells are described, and they are believed to serve a defensive function. In part 2 the route followed by the vascular elements supplying the central bud of *Agave* spp. is discussed, showing how they are destroyed when the bud is removed. It is also indicated that all the substances in the plant juice ("aguamiel") come from materials stored in the leaves and not directly from the soil. In part 3 the calcium phosphate and calcium oxalate crystals found in the leaf tissues are identified and described, and hypotheses are presented as to their physiological functions.

Cellophane cover slips and a method for mounting, I. BUCHOLTZ (*Science, 92 (1940), No. 2393, p. 436*).

A simple duplicator for labeling slides, P. H. RALPH (*Science, 93 (1941), No. 2402, p. 46, fig. 1*).

An apparatus for measuring microscopic objects, J. C. LOTZE and M. J. YINKEST. (U. S. D. A.). (*Science, 93 (1941), No. 2402, pp. 45, 46, fig. 1*).—The apparatus described and illustrated was designed for measuring minute objects, such as anaplasmas, etc., in tenths of a micron.

Fluorescence microscopy in biology, P. ELLINGER (*Biol. Rev. Cambridge Phil. Soc., 15 (1940), No. 3, pp. 323-350*).—A comprehensive review (about 6 pages of references) considering the history, technic, and results of fluorescence microscopy, including the examination of spontaneous fluorescence of animal and plant tissues, fluorescence microscopy in bacteriology, and the results of intravital microscopic studies.

A dry-ice freezing unit for cutting frozen sections, K. U. SMITH (*Science, 92 (1940), No. 2390, p. 364, fig. 1*).

An inexpensive apparatus for drying from the frozen state, A. R. TAYLOR and J. W. BEARD (*Science, 92 (1940), No. 2400, pp. 611, 612, fig. 1*).—A simple and inexpensive apparatus is described for use of a specially prepared calcium sulfate ("Drierite") as a desiccant for drying in vacuo such biological materials as viruses and serum proteins.

Experiments on the dry preservation of twigs and buds in their natural form and color [trans. title], J. KISSER (*Ber. Deut. Bot. Gesell., 58 (1940), No. 5, pp. 256-268*).

Warburg respirometers in plant physiology, J. W. BROWN (*Chron. Bot., 6 (1940), No. 6, pp. 126, 127, fig. 1*).—An abstract of an article previously noted (*E. S. R., 81, p. 620*).

An electronic relay for heat control, A. C. HALL and L. J. HEINT (*Science, 92 (1940), No. 2400, p. 612*).—An improvement in the relay previously noted (*E. S. R., 84, p. 18*).

An automatic zero pipette for dispensing sterile culture media, N. E. RIGLEY and G. A. GREATHOUSE. (Tex. Expt. Sta. and U. S. D. A.). (*Science*, 92 (1940), No. 2390, pp. 363, 364, fig. 1).—The apparatus described and illustrated is made of Pyrex glass throughout. The measuring device resembles the automatic zero pipettes commercially available but is adapted for aseptic use and has proved convenient in sterilizing and aseptically dispensing measured amounts of liquid culture media into sterile flasks. It has been especially useful when large numbers of flasks were to be filled.

An A-C powered pH set, C. W. GOODWIN (*Science*, 92 (1940), No. 2399, pp. 587, 588, figs. 2).—An A-C amplifier for use with glass electrode devices for pH determination is described and diagramed. It has high input impedance and does not fluctuate spontaneously. The resulting elimination of batteries without loss of stability will be especially convenient for recording pH over relatively long periods of time.

The pH requirements of some heterofermentative species of *Lactobacillus*, J. C. M. FERNACHON, H. C. DOUGLAS, and R. H. VAUGHN. (Univ. Calif.). (*Jour. Bact.*, 40 (1940), No. 5, pp. 649-655, fig. 1).—*L. brevis*, *L. hilgardii*, *L. fructovorans*, *L. gracilis*, and *L. pentoaceticus* were used in this study.

Enzymes concerned in the primary utilization of amino acids by bacteria, E. F. GALE (*Bact. Rev.*, 4 (1940), No. 3, pp. 135-176, figs. 3).—A comprehensive review (107 references).

Attenuation of cell stimulating bacteria by specific amino acids, J. M. VAN LANEN, I. L. BALDWIN, and A. J. RIKER. (Wis. Expt. Sta. et al.). (*Science*, 92 (1940), No. 2396, pp. 512, 513, fig. 1).—As a part of a larger program aimed at clarifying the mechanism whereby *Phytomonas tumefaciens* incites diseased overgrowths in plants, attenuation was accomplished by 20-30 transfers in a mannitol nitrate mineral salts medium containing 0.1-0.3 percent glycine adjusted to pH 6.8. A large number of other amino acids gave similar results. Only racemic mixtures of optically active amino acids were studied except for leucine, in which case both the *L*- and *DL*-compounds proved active. Although glycine was active, its ethyl ester, its anhydride, and sarcosine were not, thus indicating that the free amino and carboxyl groups might be required for attenuation. Also since diglycine was less effective than glycine and triglycine was inactive, the length of the peptide chain appears influential. Over 1,000 attenuated cultures were produced during these studies.

Onion juice and bacterial growth, J. E. FULLER and E. R. HIGGINS. (Mass. Expt. Sta.). (*Food Res.*, 5 (1940), No. 5, pp. 503-507).—Onion juice filtered through a Seitz filter had lost all of its bactericidal vapor, but still retained some power to inhibit bacterial growth when incorporated in a fluid medium. Growth of bacteria from human sources was not inhibited sufficiently to suggest any practical value, but the juice was more effective in preventing growth of bacteria of the *Bacillus subtilis* group. Live steam greatly weakened the potency of the juice, and autoclave sterilization practically destroyed it. Neither a pH range of 5.8-8 nor cold storage for 4 mo. had any effect on the bacteriostatic property.

Radioactive carbon as a tracer in the synthesis of propionic acid from CO₂ by the propionic acid bacteria, S. F. CARSON, J. W. FOSTER, S. RUBEN, and M. D. KAMEN. (Univ. Calif. et al.). (*Science*, 92 (1940), No. 2393, pp. 433, 434).

The microbiology of cellulose decomposition and some economic problems involved, N. A. WAKSMAN. (N. J. Expt. Stan.). (*Bot. Rev.*, 6 (1940), No. 12, pp. 637-665).—This comprehensive review (130 references) covers the classification of cellulose-decomposing micro-organisms, types of cellulose decomposition, the industrial utilization of cellulose decomposition, aerobic and anaero-

bic cellulose-decomposing bacteria, cellulose-decomposing fungi and actinomycetes, chemistry of cellulose decomposition, environmental relations, and problems of cellulose decomposition still remaining unsolved.

Antagonistic interrelationships among microorganisms, S. A. WAKSMAN. (N. J. Expt. Stas.). (*Chron. Bot.*, 6 (1940), No. 7, pp. 145-148).—A general review of the subject, with bibliography.

Studies on the Spirillaceae: Methods of isolation and identification, J. MYERS. (Univ. Minn.). (*Jour. Bact.*, 40 (1940), No. 5, pp. 705-721, pl. 1).

GENETICS

The masquerade of Lamarckism, R. K. NABOURS. (Kans. State Col.). (*Amer. Nat.*, 74 (1940), No. 755, pp. 562-566).—Although there is practically no scientific evidence in support of Lamarckism, the survival of biological forms specially adapted to various complexes of environmental conditions contributes to evolution in such a subtle manner as to appear to have the environment consciously direct their somatic responses.

Dominance an incidental manifestation of general gene interaction, R. A. SILOW (*Chron. Bot.*, 6 (1941), No. 8, pp. 174, 175).—A review of recent work.

Lysenko and genetics, J. B. S. HALDANE (*Sci. and Soc.*, 4 (1940), No. 4, pp. 433-437).—This is in contradiction of and in answer to some of Lysenko's theories (E. S. R., 83, p. 324), such as the belief that breeds of livestock can be altered by feeding.

The chromosome complement and its relationship to cold resistance in the higher plants, W. M. BOWDEN (*Chron. Bot.*, 6 (1940), No. 6, pp. 123-125).—A critical discussion of recent contributions.

Effect of the method of combining two early and two late inbred lines of corn upon the yield and variability of the resulting double crosses, R. C. ECKHARDT and A. A. BRYAN. (Iowa Expt. Sta. coop. U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 9, pp. 645-656).—In experiments designed to test the best method for combining two early (E) and two late (L) inbred lines of corn, no consistent differences in yield were found between the (E×E)×(L×L) and the (E×L)×(E×L) double crosses. Variances for silking date, ear height, ear weight, ear diameter, and ear length were significantly less for the (E×E)×(L×L) double crosses.

Study of the "siamensis" character in corn (*Zea mays*) [trans. title], M. E. SANGUINETI (*An. Inst. Fitotec. Santa Catalina*, 1 (1939), pp. 17-134, figs. 13; *Eng. abs.*, pp. 133, 134).—Siamensis (*sn*), the gene involved in the twinning of embryos in local corn varieties in Argentina, appeared to be a recessive, and, from linkage data, seemed to be located in chromosome 6. Segregations after selfing suggested that *sn* may be modified by other factors. The twin plants studied were always diploid and had the same number of chromosomes. The material is described and illustrated, and other cases of polyembryony are discussed.

Studies in sterility in regional forms of corn in Argentina [trans. title], E. GINI (*An. Inst. Fitotec. Santa Catalina*, 1 (1939), pp. 135-158, figs. 3; *Eng. abs.* p. 157).—Male sterility in 9 of 19 families of Argentina corn was due to heritable genes, in 6 to cytoplasmic disturbance, and in 4 to undetermined factors. The genetic and cytological behavior of the several forms are described. A new recessive (*as_{34a}*) producing asynapsis proved different from those reported by Beadle (E. S. R., 63, p. 624; 67, p. 514). Several recessive male steriles (*ms_{33a}*, *ms_{33b}*, *ms_{34a}*, *ms_{34b}*, *ms_{35a}*, *ms_{35b}*, and *ms_{35f}*) seemed normal in

meiosis and distinct from North American male steriles tested with them to date. The *ms₅₅* was linked with *Yy*, with about 8 per cent of crossing over. Cytoplasmic sterility was found only in Mais Amargo from Entre Rios, whereas that due to genetic factors had a wider varietal and geographic distribution.

Inheritance of resistance to *Cercospora oryzae* in rice, T. C. RYKER and N. E. JODON. (La. Expt. Sta. and U. S. D. A.). (*Phytopathology*, 30 (1940), No. 12, pp. 1041-1047, figs. 2).—On studying plants of the progenies of six crosses between resistant and susceptible varieties, inoculated and also exposed to field infection, resistance was found to be dominant in F_1 , and a 3-to-1 segregation of resistant and susceptible plants was secured in the F_2 . It is thus assumed that a single dominant gene was responsible for resistance. Studies of F_3 were confirmatory.

Genetics, cytogenetics, and breeding in the potato: Review of literature, F. J. STEVENSON. (U. S. D. A.). (*Amer. Potato Jour.*, 17 (1940), No. 11, pp. 299-314).—The review covers 36 titles published 1937-39.

Colchicine induced tetraploids in dioecious and monoecious species of the Amaranthaceae, M. J. MURRAY. (Cornell Univ.). (*Jour. Hered.*, 31 (1940), No. 11, pp. 477-485, figs. 5).—"Colchicine-induced tetraploids have larger cotyledons, leaves, stomata, pollen grains, ovules, stamens, flowers, and seeds than the diploids. In *Acnida tamariscina*, the cross of an XXXX female to an XXYY male gave a sex ratio of 131 ♀♀ : 1,633 ♂♂. This excess of second generation males has been explained on the basis of a high percentage of X-X and Y-Y synapsis of the XXYY males. The high proportion (85 per cent) of XY gametes, so produced, results in many XXXY plants which are males. All plants are fertile and without sex abnormalities. Intersexuality is not a barrier in this dioecious species to the production of a tetraploid race, as the cross of an XXXX ♀ to an XXXY ♂ results in a pure-breeding race, with a normal 1:1 sex ratio. Triploid males and females have also been obtained in *A. tamariscina*. The tetraploids of two monoecious species are fertile and exhibit no changes in sex. Comparisons are made between an amphidiploid and a 4n race of one of its parental species."

Heredity and environment in animal production [trans. title], G. BONNER (*K. Lantbr. Akad. Tidskr.*, 79 (1940), No. 4, pp. 301-314; *Eng. abs.*, p. 314).—A discussion is presented of the possible modifications of heritable differences in production characters resulting from changes in the environment. Suggestion is made that such effects be studied in monozygous twins.

Genetics of farm livestock, R. T. CLARK (*Montana Sta. [Bien.] Rpt.* 1939-40, pp. 16, 17).—Studies are noted on the differences in the rate of gain of progeny of specific Hereford sires and on the establishment of families of Rambouillet and Columbia sheep distinct for wool characters.

Are they identical? R. C[OOK] (*Jour. Hered.*, 31 (1940), No. 10, pp. 454, 455, fig. 1).—Triplet calves alike in color markings but consisting of 2 ♂♂ and 1 ♀ are noted.

Genetics of horns in sheep, W. E. CASTLE (Univ. Calif.). (*Jour. Hered.*, 31 (1940), No. 11, pp. 486, 487).—Referring to the papers on the inheritance of horns in sheep by Warwick and Dunkle (*E. S. R.*, 82, p. 320) and Ibsen and Cox (*E. S. R.*, 83, p. 756), the author proposes a simple hypothesis that the horn character is controlled by three allelic genes, (1) *H'*, producing horns in both sexes and whose effect is increased by the ♂ sex hormone, (2) *h*, producing horns only in the presence of the ♂ sex hormone (♂s having horns), and (3) *H*, hornless in both sexes. Intermediate phenotypes, such as scurs and knobs, are suggested as resulting from gene interaction and heterozygosis.

Evolutionary allometry in the skeleton of the domesticated dog, H. LUMER (*Amer. Nat.*, 74 (1940), No. 754, pp. 459-467, figs. 9).—Further analysis of the findings of K. Wagner³ on measurements of the skull and limb bones in 28 modern breeds of dogs showed that relationships between them permit the designation of 6 allometric tribes. All members of each tribe fell on the same curve for the relation between the same measures. This classification served for ancient and prehistoric types, as well as modern breeds. Therefore, breeds within a tribe are considered indicative of relative homogeneity with respect to ontogenetic relations in growth. Selection has operated on general size factors differently in different breeds.

The Soviet rabbit "Marder" [trans. title], A. V. KLETOHENKO (*Yarozivatsiya*, No. 4 (1939), pp. 128-134, figs. 2; *abs. in Biol. Abs.*, 14 (1940), No. 9, p. 1374).—A dark-brown ♂ was produced among other progeny from a mating of a chinchilla ♀ with a Russian ermine ♂. This individual was lighter below, with darker extremities and back stripe. Half the progeny from this ♂ and Vienna Blue chinchilla and mongrel ♀s resembled the father. By continued inbreeding the Marder variety was established.

Linkage studies of the rat (*Rattus norvegicus*), III, W. E. CASTLE and H. D. KING. (Univ. Calif. et al.). (*Natl. Acad. Sci. Proc.*, 26 (1940), No. 9, pp. 578-580).—Continuing this series (E. S. R., 77, p. 468), linkage tests between the character producing the jaundice syndrome designated as *j* by C. H. Gunn⁴ showed jaundice to be a marker for the tenth chromosome group in the rat. In suitable backcrosses to double recessives and *F*₂ populations, jaundice was shown to be independent of the genes for agouti, albinism, curly, curly, dilute, hooded, hairless, kinky, and wobbly. Other mutant genes for which no tests have been made because they are known to be linked with one or another of the genes already enumerated are those for brown, anemia, Grfineberg lethal, pink eye, red eye, and waltzing.

Abnormal growth in a strain of rats characterized by low fertility and a high incidence of benign mammary tumors, J. M. WOLFE, E. BURACK, and A. W. WRIGHT (*Endocrinology*, 27 (1940), No. 6, pp. 883-887, figs. 2).—A strain of rats which exhibited approximately 40 percent of mammary tumors at 14 mo. of age and a high degree of low fertility was found to show a growth rate inferior to that of the control strain with a low incidence of mammary tumors. Possible hormones of the pituitary are thought to be responsible.

Report of the committee on mouse genetics nomenclature, L. C. DUNN, H. GRÜNEBERG, and G. D. SNELL (*Jour. Hered.*, 31 (1940), No. 12, pp. 505, 506).—The report of the committee on mouse genetics nomenclature is presented with indications for the list of mutant genes and recommended symbols. The symbols selected for each and their linkage groups are indicated.

"Rhino," an allele of hairless in the house mouse, A. HOWARD (*Jour. Hered.*, 31 (1940), No. 11, pp. 466-470, figs. 2).—A condition in mice designated as rhino, in which the hair began to fall out at from 13 to 14 days of age and was accompanied by wrinkling of the skin, was found to be due to a recessive gene. The skin folds caused certain abnormalities in walking. Crosses of rhino with hairless mice produced mice that were hairless, but they remained smooth skinned. Since no normals were produced, rhino was concluded to be another allele in a series with *hr*, and the individuals were indicated as *hr_{rh}*. Rhino mice were found fertile in both sexes but unable to produce milk. In the *F*₂, hairless mice are three times as numerous as rhinos; thus *hr* is dominant to *hr_{rh}*.

³ Norske Vidensk. Akad. Oslo, Mat. Naturv. Kl. Skr., 8 (1929), No. 9, pp. 157, pls. 12, figs. 36.

⁴ Jour. Hered., 29 (1938), No. 4, pp. 137-139, fig. 1.

The effects of the injection of Antuitrin G upon a strain of harelip mice, L. C. GLASS. (Univ. Idaho). (*Amer. Nat.*, 74 (1940), No. 755, pp. 566-568).—The influence of Antuitrin-G, the growth hormone, on the development of harelip in strains of mice afflicted with this condition and injected with 10 daily doses at mating was studied. Some reduction in litter size but no change in the occurrence of harelip was found in the 17 young whose dams were injected with $\frac{1}{2}$ unit. Injection with $\frac{1}{10}$ unit increased the average litter size from 4.25 to 6, and the percentage of harelip in 14 young increased to 46.7 as contrasted with 30.2 in the untreated controls.

Genetic studies in poultry.—XI, The Legbar, R. C. PUNNETT (*Jour. Genet.*, 41 (1940), No. 1, pp. 1-8, pl. 1, figs. 2).—Continuing this series (E. S. R., 83, p. 181), the author reports that study of the down color of the progeny of light and dark Legbar parents showed that there was a definite factor leading to darkening of the down feathers brought in by the dark Danish Brown Leghorn strain used in the origin of the breed. This factor was dominant to the ordinary lighter brown-striped type. There seemed to be modifying factors tending to make the heterozygous birds grade into lighter or darker classes, but the darker type is dominant to the lighter type. Mating F_1 δ s from a Legbar $\delta \times$ Brown Sussex ϕ to Brown Sussex hens produced barred and unbarred chicks of both sexes. In this group the ϕ s all showed a tingeing of the shanks at hatching, but it disappeared at maturity. Further analysis of the shank color showed that the two sex-linked factors for mesodermal shank pigmentation, *Id* (shank pigmentation inhibitor) and *B* (barring), suppress mesodermal pigmentation before maturity. They were so closely linked that mating double heterozygotes with barred ϕ s produced four types of offspring, i. e., homozygous and heterozygous barred δ s, barred ϕ s, and unbarred ϕ s, in approximately equal numbers. Since homozygous δ s lacked *Id*, they showed tinged shanks, while heterozygous barred δ s hatched with light shanks. Of 69 progeny so produced there were 4 that were cross-overs. The Legbar has the mesodermal shank pigment derived from the Plymouth Rock, but it is inhibited at maturity by the barring factor.

The developmental anatomy of the Brown Leghorn breast feather, and its reactions to oestrone, P. G. ESPINASSE (*Zool. Soc. London Proc.*, 1939, Ser. A, IV, pp. 247-288, pls. 5, figs. 12).—The growth of marked feathers appearing in the breasts of three Brown Leghorn capons following plucking and injection of doses of from 0.025 to 0.15 mg. of oestrone is described in comparison with feather development noted by Fraps and Juhn (E. S. R., 77, p. 610). It was evident that this hormone spread over the whole area if administered in sufficient quantities and caused a salmon streak on all feathers at the same time. Those nearest the site of injection reacted longest and with the greatest intensity. Injections gave most pronounced effects in the feathers on the side of the injection. Suggestion of the capture and storage of oestrone by the feather germs is given some support. The method may also offer possibilities for testing the oestrone potency of hormones.

Auto-sex linkage in the domestic fowl: Modifiers of the gene for barred feathers, R. G. JAAP (*Okla. Acad. Sci. Proc.*, 20 (1940), pp. 21, 22).—Utilizing the knowledge that two sex-linked genes for white barring tend to make a lighter head spot on δ s than one gene in the sex chromosome in ϕ s, the author studied the modifications of the down color at hatching by sex-linked genes of this kind. In the development of a sexing strain at hatching there were utilized Barred Plymouth Rocks, Partridge Plymouth Rocks, and Rhode Island Reds. Of the chicks produced there were 109 basically striped, of which the δ s (having two barring genes) were much lighter in color at hatching than ϕ s (one barring gene). There was not the clear sex distinction of the red and mahogany progeny.

Four methods of chick sexing, J. J. MACILRAITH and J. H. PETTIT (*Ontario Dept. Agr. Bul.* 418 (1940), pp. 9, figs. 7).—Four methods of chick sexing based on the down color and plumage pigmentation of Barred Plymouth Rocks, feather growth in purebreds and hybrids, and sex-linked and color characters in crossbreds are presented.

Correlation in egg weight between mothers and daughters, F. A. HAYS. [Mass. Expt. Sta.]. (*Jour. Hered.*, 31 (1940), No. 11, p. 476).—Study of the size of eggs produced by mothers and daughters in three lines of Rhode Island Reds selected for small, medium, and large egg size for nine generations showed that regression was nonlinear in all lines. Presumably, this was due to the heterozygous nature of the mothers for genes affecting egg size, since all sires were full brothers. The similarity of correlations between dams and daughters for egg size in all lines is taken to support the hypothesis that genes affecting egg size are autosomal.

The problem of the moult in the castrated Brown Leghorn fowl, A. W. GREENWOOD and M. BURNS (*Quart. Jour. Expt. Physiol. and Cog. Med. Sci.*, 30 (1940), No. 2, pp. 163-171, fig. 1).—The shedding of feathers by three capons was compared with two ♂s and classified as to feather type and location for each month of the year. The capons exhibited a tendency to cast feathers in the winter, with intensification of the process in the spring and reaching a maximum in May or June. The ♀s molted much later, in the fall or early winter. The molting of ♂s was intermediate. It appears that reproductive activity inhibits the onset of molting. Distinct and characteristic evidence of rhythms of feather casting in various regions of the plumage was observed.

Spermatozoal antibodies and infertility in the fowl, W. F. LAMOREUX. (Cornell Univ.). (*Jour. Expt. Zool.*, 85 (1940), No. 3, pp. 419-430).—Study was made in three series of experiments of the influence of semen injections by subcutaneous and intravenous methods, with the resulting formation of antibodies on the fertility of eggs laid during the period of treatment. Injection of as much as 60 cc. of semen during a 10-week period did not show an appreciable increase in the titer of agglutinins against spermatozoa. Even when titers as high as from 1 to 2,000 were induced there was no demonstrable effect on the fertility of the eggs. No evidence of increased infertility induced in frequently copulating hens was noted, nor was it brought about as a result of intramuscular or percutaneous administration of testosterone propionate.

[Physiology of reproduction in horses], J. R. QUESENBERY. (Coop. U. S. D. A. and Mo. Expt. Sta.). (*Montana Sta. [Blen.] Rpt.* 1939-40, pp. 62, 63).—Studies were made of the oestrous cycle and improved methods of artificial insemination of mares.

The reproductive cycle of the male weasel (*Mustela nivalis*), M. HILL (*Zool. Soc. London Proc.*, 1939, Ser. B, III-IV, pp. 481-512, pls. 3, figs. 16).—Based on a study of 327 ♂ weasels, a description is given of the seasonal changes in the reproductive development and histology of the gonadal tissues.

Effects of hypophysectomy in the chick embryo, N. W. FUGO (*Jour. Expt. Zool.*, 85 (1940), No. 2, pp. 271-297, pls. 3, figs. 6).—The removal of the pituitary preprimordium from 33- to 38-hr. chick embryos was found to have no effect on the primary morphological differentiation of organs, but its deficiency was noted in the second half of incubation. The removal of the pituitaries seemed to cause a reduction in growth and the lack of the thyrotropic and gonadotropic hormones affecting normal development of body size, thyroids, plumage, and gonads.

Effects of anterior pituitary extract on spermatogenesis in rat, H. S. RUHNSTEIN and A. R. ABARBANEL (*Jour. Urol.*, 41 (1939), No. 5, pp. 773-779, figs. 2).—Injection of 10 rat units of an extract of sheep anterior pituitary

for 4 days, followed by 20 rat units for 6 days, was studied as to the effect of these doses on body and testis development of rats over and under 45 days of age. There was proliferation of the germinal epithelium in both mature and immature animals. However, maturation was not hastened in immature rats. The testis weight of mature animals was increased, but there was no significant change in the testis size in immature animals, although testicular descent was hastened.

Proposed names for the follicle-stimulating and interstitial cell-stimulating hormones of the anterior lobe of the pituitary body, H. C. COFFIN and H. B. VAN DYKE (*Science*, 93 (1941), No. 2403, p. 61).—The names "thylakentrin" and "metakentrin" are suggested for these hormones.

The action of various steroid hormones on the ovary, H. SELYE and S. M. FRIEDMAN (*Endocrinology*, 27 (1940), No. 6, pp. 857-866, figs. 15).—Various steroids, desoxycorticosterone acetate, progesterone, testosterone, and oestradiol, were found to exert a gonad-inhibitory action on the rat ovary resulting from a depression in the gonadotropic hormone production of the pituitary. Atrophy of the ovarian stroma development, inhibition of follicle development, and the development and formation of the corpora lutea seem common.

Hyperfunction of anterior pituitary in rats.—II, Estrus cycles, B. K. HARNED and V. V. COLE (*Science*, 92 (1940), No. 2390, pp. 361, 362).—Continuing these papers (E. S. R., 82, p. 322), the authors report that oestrous cycles averaged 4.5 and 5.5 days in two strains, respectively. These results were interpreted as an indication of the genetic difference in the strains involving hyperfunction of the anterior pituitary of the strain with the longer cycles.

Induction of fertility by the injection of gonadotrophic preparations, A. S. PARKES and J. HAMMOND (*Vet. Rec.*, 52 (1940), No. 30, pp. 540-543, figs. 2).—By the injection of horse pituitary extract it was possible to induce ovulation of from one to three ova in out-of-season ewes. Injection of the extract during the last 3 or 4 days of a normal cycle caused superovulation at the next oestrus. When injections were made a few days before the onset of oestrus, the corpora lutea inhibited ovulation, and the ripening follicles apparently banked up. If 50 mg. of horse pituitary extract were then administered, from seven to nine ova were shed. In some cases, seven fertilized ova were recovered. Five embryos were removed from the uterus at half term. This dose of extract produced practically 100 percent ovulation in April in barren ewes or in ewes that had lost their lambs. A second injection from 15 to 17 days after the first was needed to induce mating, especially to obtain a second lamb during the same year.

A study of the mechanism whereby copper acetate and certain drugs produce ovulation in the rabbit, C. M. BROOKS, W. G. BEADENKOFF, and S. BOJAR (*Endocrinology*, 27 (1940), No. 6, pp. 878-882).—Ovulation was induced in normal unanesthetized and anesthetized rabbits by intravenous injections of copper acetate. Transection of the hypophyseal stalk 80 days or more prior to the administration of the copper salts prevented ovulation, suggesting that copper salts caused ovulation by acting through the central nervous system.

The production of ovulation and functional corpora lutea in rabbits before and after transection of the hypophysial stalk, C. M. BROOKS, S. BOJAR, and W. G. BEADENKOFF (*Endocrinology*, 27 (1940), No. 6, pp. 873-877, fig. 1).—Although abnormally large quantities of pregnancy urine extract were required in some cases to induce ovulation in rabbits having the hypophyseal stalk transected, only the normal amounts were needed in general, and the corpora lutea formed remained functionally active for from 10 to 12 days following injection. Decidual changes did not occur, but progestational changes were observed in these animals.

Artificial insemination [trans. title], B. RIVERIN (*Bonne Terre*, 21 (1940), No. 3-4, pp. 111-122).—A brief account is given of the technic and methods employed in the practice of artificial insemination with livestock.

Artificial insemination of cattle, L. A. GENDREAU (*Canad. Jour. Compar. Med. and Vet. Sci.*, 4 (1940), No. 8, pp. 230-233, figs. 5).—Current views on methods of collection of sperm and the practice of artificial insemination of cattle are discussed.

The effect of storage temperatures upon certain characteristics of bovine semen, H. P. DAVIS, G. K. L. UNDERBJERG, and N. K. WILLIAMS. (Nebr. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 11, pp. 1057-1068).—Semen samples from 11 bulls of different breeds were stored up to 90 hr. at temperatures ranging from 35° to 50° F. and studied as to their comparative motility, pH, concentration of sperm per cubic millimeter, and viability in fertility experiments. Motility within the range studied had no effect on the keeping quality of the sperm. The lower pH was associated with a higher progressive motility and higher concentration of sperm. The storage temperature of 35° was most advantageous, since at that temperature the least change in viability and composition of the semen occurred.

The buffering capacity of bull semen, S. E. SMITH and S. A. ASDELL. (Cornell Univ.). (*Cornell Vet.*, 30 (1940), No. 4, pp. 499-506, figs. 4).—Neutralization curves and buffer coefficients calculated for fresh bull semen showed it to be well buffered in the regions of pH 4.0 to 5.5 and 9.0 to 10.0 but poorly buffered at other degrees of acidity. The buffering action of one sample of seminal vesicle fluid was similar to the semen, but the buffering action of aged semen was reduced.

Preservation of bovine spermatozoa in yolk-phosphate diluent and field results from its use, E. L. WILLETT, H. K. FULLER, and G. W. SALISBURY. (Cornell Univ. et al.). (*Cornell Vet.*, 30 (1940), No. 4, pp. 507-513).—By storage at 5° C. in dilution with the yolk-buffer pabulum described by Phillips and Lardy (*E. S. R.*, 83, p. 615), motility was maintained in some samples examined after 8 days. Conceptions were obtained from samples stored in this diluent as long as from 4 to 5 days. The results were based on over 1,500 inseminations in artificial breeding associations.

The effect of a non-androgenic testis extract on the estrous cycle in rats, D. R. McCULLAGH and I. SCHNEIDER (*Endocrinology*, 27 (1940), No. 6, pp. 899-902, figs. 4).—Studies on ♀ rats showed that injections of inhibin, a fat-free extract of bull testes, over periods of from 3 to 9 days caused cessation or interruption of the oestrous cycles.

The estrin content of the follicular fluid and urine of the mare and its relation to phenomena of the estrual cycle, D. T. MAYNE, F. N. ANDREWS, and F. P. MCKENZIE. (Mo. Expt. Sta., Mont. State Col., and U. S. D. A.). (*Endocrinology*, 27 (1940), No. 6, pp. 867-872).—Specimens of urine and follicular fluid from Percheron, Belgian, and Shire mares at different stages of the oestrous cycle were quantitatively analyzed colorimetrically for the presence of oestrogens expressed as crystalline oestrone. The volume of follicular fluid that could be collected from the follicles varied with their age and size. The largest quantities were collected during oestrus. The oestrogen concentration of the follicular fluid was approximately identical at all stages. Therefore, the production of oestrogens was associated with the amount of fluid and the size of the follicle. There were two peaks in oestrogen production in the urine occurring during oestrus and between the tenth and fifteenth days of the cycle. During pregnancy there was a marked increase in oestrogen production as early as 30 days after conception.

Some effects of corpus luteum extracts and of synthetic progesterone on young male albino rats, J. K. LAMAR (*Physiol. Zool.*, 13 (1940), No. 3.

pp. 251-266, pl. 1).—Studies of the influence of administering corpus-luteum extracts from sows and synthetic progesterone to albino rats, mice, and rabbits suggested a weak androgenic action from these preparations. A significant weight increase was induced in the secondary sexual glands in castrated immature rats except that there was no decided weight change in the seminal vesicles. There was a significant weight decrease in the body weight. Sufficient differences were noted in the androgenic effects of progesterone and testosterone to suggest the action of different factors. The action of injections of oestrone was very dissimilar. These results thus show a bisexual effect of progesterone on the immature rat.

Modification of the intrauterine assay method for progesterone, A. L. HASKINS, JR. (*Endocrinology*, 27 (1940), No. 6, pp. 983-988, figs. 13).—A quantitative bio-assay of progesterone is suggested which is based on the epithelial and muscle mitotic counts when the doses were applied to the uteri of oestrogen-primed immature rabbits. Amounts of progesterone within the range of from 0.06 γ to 1.7 γ only could be tested quantitatively.

A new estrogenic substance present in the neutral fraction of human pregnancy urine, R. I. DORFMAN (*Science*, 92 (1940), No. 2399, pp. 585, 586).—In addition to oestrone, oestradiol, and oestriol, a fourth oestrogenic compound was found in the alkali-insoluble substance left after extracting human pregnancy urine with alkali, acid butanol, and ether.

The embryology and postnatal development of the prostate gland in the female rat, J. J. MAHONEY (*Anat. Rec.*, 77 (1940), No. 3, pp. 375-395, pls. 2, figs. 3).—The histological development of the \varnothing prostate is described from two strains of rats. In one strain there was a 98-percent incidence of the gland in \varnothing s, whereas there were neither rudiments nor vestiges of prostate glands in \varnothing s of 13 days of age in the other strain. Development in the \varnothing s up to 30 days of age was much like development of the ventral lobe of the prostate in normal δ s. Following 30 days, involution comparable to that following castration was noted.

The specificity of the lactogenic hormone in the initiation of lactation, A. J. BERGMAN and C. W. TURNER (Mo. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 12, pp. 1229-1237).—Studies in which graded doses of the lactogenic and thyrotropic hormones were administered singly and in combination to pseudopregnant rabbits showed that the primary function of the lactogenic hormone was to initiate and maintain established lactation. Thyrotropic hormone in large amounts, even in rabbits thyroidectomized to prevent metabolic disturbances, was not able to initiate lactation in a significant proportion of the animals. However, thyrotropic hormones had a beneficial supplementing effect on established lactation.

Evidence for the presence of a second mammogenic (lobule alveolar) factor in the anterior pituitary, J. P. MIXNER, A. A. LEWIS, and C. W. TURNER (Mo. Expt. Sta.). (*Endocrinology*, 27 (1940), No. 6, pp. 888-892, figs. 3).—Groups of castrated mice given daily doses of from 50 to 200 mg. of fresh anterior pituitary from pregnant cows were found to respond in the development of a lobule alveolar system comparable to that found in \varnothing s 4 to 10 days pregnant. There is thus a second anterior pituitary mammogenic factor relating to the growth of the lobule alveolar system.

FIELD CROPS

The response to fertilizers of soils of the Blackland prairie section of Texas as determined by the triangle system, J. E. ADAMS, H. V. JORDAN, and P. M. JENKINS. (U. S. D. A.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 9,

pp. 657-663, figs. 5).—Cotton grown in fertilizer tests (E. S. R., 80, p. 762) on Houston black clay soil (20 tests), Hunt clay (9), and Wilson clay loam (6 tests) averaged 604, 493, and 360 lb. of seed cotton on unfertilized plats. The average analysis of the three best fertilizers was 10-3-2 for the Houston, 7-4-4 for the Hunt, and 5-6-1 for the Wilson soil, and they produced respective maximum increases in yield of 115 lb. for the Houston, 129 for the Hunt, and 244 for the Wilson soil. Gradients in fertility and response to fertilizers were noted with changes from Houston to Hunt to Wilson soils. The triangle system was particularly effective in obtaining orienting information on the fertilizer needs of soils of the section. The Latin square and other approved field experimental designs, used since 1935 to test fertilizers indicated by the triangle experiments as of greatest importance, confirmed data secured by the triangle system.

[Crop improvement in Arkansas]. (Partly coop. U. S. D. A.). (*Arkansas Sta. Bul.* 405 (1940), pp. 29-36).—Outstanding new strains, the result of breeding work and subsequent performance tests, included Rowden 41A, 41B, 42A, and 42C cottons; a number of yellow corn lines and white lines outyielding leading open-pollinated varieties; Arkansas Fortuna and Zenith rice (E. S. R., 84, p. 40); and promising strains of oats derived from Lee X Victoria oats. Variety tests showing the superiority of winter oats over spring oats as an Arkansas crop are reviewed, with results of planting and fertilizer experiments with the crop.

[Field crops and range investigations in Colorado]. (Partly coop. U. S. D. A. et al.). (*Colorado Sta. Rpt.* 1940, pp. 9-12, 20, 21, 31, 33, 34, 42-46).—Agronomic research (E. S. R., 82, p. 762) reported on briefly included breeding work with corn (and hybrids) (E. S. R., 83, p. 186), alfalfa, barley, and sorghums; studies of factors responsible for hydrocyanic acid content of Sudan grass; potato research, including breeding work, yield, starch, and mineral content of potatoes grown in the principal potato-growing sections of Colorado as affected by the available soil nutrients and by moisture conditions, fertilizer tests, and seed certification; and research on natural revegetation of native range, involving different grazing methods, a study of nutritive value of range forage, artificial revegetation with native and introduced grasses of depleted range and abandoned croplands and measurement of their grazing capacities, irrigation and management practices to maintain and improve native hay meadows, and range resource surveys.

[Field crops research in Montana], A. H. POST, W. O. WHITCOMB, F. M. HARRINGTON, W. E. POLLINGER, D. HANSEN, A. E. SEAMANS, R. M. WILLIAMS, and F. S. WILLSON. (Partly coop. U. S. D. A.). (*Montana Sta. [Bion.] Rpt.* 1939-40, pp. 11-15, 23-31, 34, 35, 47, 48-50, 51, 52, 54, 55, 58, 59).—Current and completed agronomic research (E. S. R., 80, p. 757) reported on briefly included breeding work with wheat, barley, oats, corn, field beans, and grasses; variety tests with wheat, oats, barley, sugar beets, and miscellaneous forage grasses; a test with Ladak alfalfa; fertilizer trials with potatoes, including tests with boron, and with sugar beets; cultural (including planting) tests with crested wheatgrass and other forage grasses, alfalfa, wheat, oats, barley, rye, and corn; crop rotations on dry land and under irrigation and variously fertilized; crop-producing capacity of soils; soil fertility studies; the value of corn in a dry farming program where the corn can be used in the locality; effect of severe weathering on grade, milling, and baking qualities of wheat, and study of oven spring of dough; regressing abandoned cropland and other uses of crested wheatgrass; studies of hard seeds in legumes, of seed value of light-weight wheat, and characters of strains of crested wheatgrass (E. S. R., 82, p. 39); and control of dandelions in lawns with kerosene.

[Crops research in Puerto Rico in 1939] (*Puerto Rico Sta. Rpt. 1939*, pp. 46-49, 50, 69-71, 98-100, figs. 5).—Variety tests with soybeans, corn, and sugarcane; breeding work with corn and soybeans; an adaptation test of annual teosinte; and work with the Abyssinian cowpea (*Dolichos hosei*), superior as a legume ground cover on steep banks and preferred to para grass by cattle, are reported on briefly.

[Crops research notes] (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 4, pp. 7, 10).—Weed control by chemicals, clean cultivation, and cropping-cultivation combinations; adaptation of strawberry clover for wet locations, even with some alkali; and reduction of cover, seed yield, and depth and weight of roots on range lands by too early and too heavy grazing (*E. S. R.*, 83, p. 763) are described briefly.

Some problems in breeding barley for industrial uses, G. A. WIEBL. (U. S. D. A.). (*Brewers Digest*, 15 (1940), No. 11, pp. 43-45, fig. 1).—A practical discussion of aims and methods of barley improvement.

Bulbous bluegrass, valuable for reseeding intermountain ranges, A. C. HULL, JR. (U. S. D. A.). (*Natl. Wool Grower*, 30 (1940), No. 8, pp. 32, 33, 41-44, figs. 2).—The distribution, habitat, and life history of *Poa bulbosa* (*E. S. R.*, 69, p. 645). its aggressiveness, germination, rate, and depth of planting the bulbils, establishing stands, forage yields, and its possibilities are described from experiments and observations in the intermountain region.

Winter clover pastures for peninsular Florida, R. E. BLASER and F. T. BOYD (*Florida Sta. Bul.* 351 (1940), pp. 29, figs. 12).—Further experiments with clovers for pasture (*E. S. R.*, 80, p. 186), largely in cooperation with livestock owners, were concerned with fertilizer needs on acid flatwoods sands and acid mucks and on slightly acid or alkaline soils, influence of fertilizer treatment and soil type on chemical composition of clovers, seeding and management practices, varietal behavior, and advantages of clover in pasture mixtures. Fertilizer treatments, seeds mixtures, and establishment and management practices are indicated for the several soil types and conditions.

To establish clover successfully in Florida, test results show that the soil must be properly fertilized and suitable varieties planted under adapted ecological conditions during a rainy period in October or November on closely grazed sods or well-packed seedbeds. Clover made good growth on acid soils, such as low-lying phases of Leon, Plummer, Portsmouth, Johnson, Scranton, Bladen fine sands, and acid mucks. Slightly acid or alkaline soils, with calcareous substrata, such as mucks and sandy mucks and low marl hammocks, also have proved satisfactory. Moisture requirements for different varieties varied, but none of the winter clovers tested in Florida furnished much feed under dry soil conditions. Unsatisfactory growth was noted on high ridge soils, as Norfolk sand, and high phases of Leon sandy soil. A mixture of Louisiana white Dutch and California bur-clovers appeared to be the most promising clover combination. Black medic, crimson, Persian, hop, little hop, red clovers, and Hubam sweetclover also have been productive under certain conditions.

Corn production in Colorado, W. H. LEONARD, J. F. BRANDON, and J. J. CURTIS. (Coop. U. S. D. A.). (*Colorado Sta. Bul.* 463 (1940), pp. 38, figs. 7).—Corn varieties and hybrids and their adaptations, seed and its care, corn improvement, rotations, cultural and field methods, and irrigation and harvesting practices are described from prolonged experiments mainly on dry land at Akron and at the station, and largely noted earlier.

Good varieties comprised locally adapted strains of Minnesota 18, with average frost-free season 110-130 days, Reid Yellow Dent 120 days or longer, and Logan

County White and locally adapted corns for dry land in eastern Colorado. Hybrids have not been as promising at Akron as under irrigation (E. S. R., 52, p. 39). Productive practices included growing corn after a legume or a cultivated crop under irrigation or after fallow or corn on dry land; fall or early spring listing on dry land: four or five plants per hill or drilling from 6 to 9 in. apart under irrigation and plants from 24 to 30 in. apart in 44-in. rows for grain or from 12 to 18 in. apart for silage on dry land; planting May 1-10 in northern Colorado under irrigation and May 15-25 at Akron; cultivation enough to control weeds; and irrigating two or three times, especially at tasseling.

Spacing experiments with corn, A. A. BRYAN, R. C. ECKHARDT, and G. F. SPRAGUE. (Iowa Expt. Sta. coop. U. S. D. A.) (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 9, pp. 707-714).—Comparison, 1936-39, of yields and other agronomic data from corn hybrids, double crosses, and varieties grown at five spacings ranging from 42 by 42 in. to 21 by 14.7 in. revealed that no consistent and material advantage would result from spacings closer than currently used, i. e., about 42 by 42 in. Within comparisons involving the same number of plants per acre, minor variations in spacing had little effect on acre yield.

Cotton variety experiments at seven locations in Georgia, 1937-1940, R. P. BLEDSOE and U. R. GORE (*Georgia Sta. Cir.* 124 (1940), pp. 4).—Variety tests with cotton supplementing earlier work (E. S. R., 83, p. 187) revealed that Stoneville 2B led north Georgia tests in highest average lint yield and money value per acre and was approached by D. and P. L. 11A and 12. Coker 100 also had a good record but is very susceptible to wilt. The high-ranking varieties in south Georgia tests on wilt soil were Coker 4-in-1, Coker Clevevilt 7, and W. W. Wannamaker Clevevilt Resistant, all highly wilt-resistant, stapling 1 in. or longer and with a fair ginning percentage and good-sized boll. Early Wilt, a new variety deemed promising for south Georgia, came from a cross of Cleveland Wilt Resistant and Stoneville 5 and is both resistant to wilt and to root knot nematode and is early. Rhyne Cook has made the best showing of the 7₈-in. cottons.

The influence of a 3-year rotation and fertilizer treatments on the organic carbon of soils, W. H. COATES. (N. H. Expt. Sta.). (*Amer. Potato Jour.*, 18 (1941), No. 1, pp. 19-26, fig. 1).—Experiments showing that losses of organic carbon are to be expected when potatoes are grown in a 3-yr. rotation, as potatoes, oats, and clover, with the removal of all crops, and that additions of lime and formulas high in phosphorus were the most effective treatments in reducing organic carbon losses, have been noted from another source (E. S. R., 84, p. 326).

Variations in cooking quality of potatoes as influenced by fertilizers, P. T. BLOOD and J. L. HADDOCK (*Amer. Potato Jour.*, 16 (1939), No. 12, pp. 329-335; also *New Hampshire Sta. Sci. Contrib.* 75 [1939], pp. 329-335).—Experiments with potatoes (E. S. R., 84, p. 326) demonstrated that the fertilizer ratio has had a pronounced influence on the cooking quality (mealiness) of potatoes but could be varied to maintain high quality and high yields. Fertilizers relatively high in potash have lowered cooking quality, whereas extra phosphoric acid increased quality and yields slightly. The general external appearance of the tubers seemed to be improved, but cooking quality was not enhanced, by application of a small amount of boron in the fertilizer.

Effect of time of seeding on yield, milling quality, and other characters in rice, C. R. ADAIR. (U. S. D. A. and Ark. Expt. Sta.). (*Jour. Amer. Soc. Agron.*, 32 (1940), No. 9, pp. 697-706).—Date-of-seeding tests, 1932-39, at Stuttgart, Ark., included 15 kinds of rice planted on four or five dates at 15- to

20-day intervals. Varieties were grouped as sensitive or indifferent in response to date of planting. The sensitive varieties showed a gradual but marked decrease, ranging from 18 to 26 percent, in number of days required to reach maturity when planted on successively later dates, and the indifferent varieties showed a small but less consistent shortening of the growth period, ranging from 9 to 15 percent, with delay in planting. The sensitive rices showed a gradual reduction in height from the first to the last date of seeding, whereas the indifferent were variable and usually showed no consistent reduction in height due to delay in seeding. Most varieties produced more straw in proportion to grain when sown in April than when sown in May or June. The highest yield of grain generally was obtained from late May seeding, although Nira and Arkansas Fortuna produced best from early May seeding. All varieties were highest in milling quality when they ripened during the cooler weather in late September and early October.

Nitrogen-potash-sunlight relationships, R. J. BORDEN (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 44 (1940), No. 4, pp. 237-241).—Fertilizer experiments with sugarcane revealed that when sunlight conditions were such as to limit complete assimilation of applied nitrogen and potassium fertilizers sugar yields would be affected adversely.

Further studies in nitrogen nutrition: Amounts-of-nitrogen test, A. H. CORNELLISON and H. F. COOPER (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 44 (1940), No. 4, pp. 273-308, figs. 26).—Field experiments with sugarcane were made to study further (E. S. R., 75, p. 623) effects of nitrogen fertilization on the growth and yields of sugarcane, to study physicochemical and biochemical changes within the plant, and to establish a clearer theory of sugar metabolism and storage and its use in the plant as affected by age and season, irrigation, and varieties. This paper discusses the findings on the effect of nitrogen when supplied at rates of 0, 100, 200, and 400 lb. per acre, in one application, with uniform amounts of phosphorus and potassium.

Effects of nitrogen fertilization on the plant appeared to be controlled largely by weather during the period of most active utilization of nitrogen by the plant. Of effective factors making up the weather complex, temperature, above a certain minimum, seemed to be most important through acceleration of vegetative activity and respiration rates. The genetic age of the plant influences the magnitude of temperature effects and the sucrose storage at any time. Physical and chemical properties of the cell structures are influenced greatly by variable rates of vegetative activity, and, in some cases, changes induced appear more or less permanent. The difference between sugars elaborated by photosynthesis and fractions used in tissue formation and respiration determines at any time the amount of stored sucrose. Nitrogen applications appeared to produce increases in rates of all these functions up to a certain limit, beyond which optimum there was a disproportionate increase in the tissue formation and respiration rates and a resultant lowering in sucrose storage per volume of stalk. The optimum application thus becomes dependent upon temperature or age conditions as to magnitude.

Colchicine in relation to sugar cane breeding, D. M. WELLS (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 44 (1940), No. 4, pp. 251-261, figs. 11).—Effects of colchicine on sugarcane are described and illustrated. Numerous seedlings developing from treated seeds of some 50 hybrids within the genus *Saccharum* showed various effects. Below the lethal treatment, which differed for varieties, stimulation or depression of growth resulted according to concentration of solution and duration of treatment. Shoots developing after treatment with high concentrations were short, broad, globose, or sometimes

differed little in external appearance from normal. Cytological study of such seedlings showed the cells of their coleoptiles and growing points to contain lobed nuclei or multinuclei. Division figures exhibited abnormal spindles and an increased number of chromosomes staining more deeply than normally. Seed treated with aqueous solutions of colchicine showed an increase in germination percentage and also stimulation of seedling growth. Very young buds near the growing points of mature cane developed into shoots differing little vegetatively from the parent plant, but flowers of such shoots produced pollen grains several times as large as normal. Often effects of colchicine, either stimulation or depression of growth, appeared in stalks developing from eyes (on the same seed piece) other than those treated.

Wheat varieties for North Carolina, G. K. MIDDLETON, W. H. CHAPMAN, J. W. HENDRICKS, and D. W. COLVARD (*North Carolina Sta. Bul.* 328 (1940), pp. 11, fig. 1).—Carala, an early stiff-strawed wheat indicated for pastry purposes, originally designated as Alabama Blue Stem 89 and resembling Purple-straw in a number of agronomic characters, made the highest average acre yields, 27.6 bu., 1933-40, at Statesville, and led all named wheats, with an average of 32.7 bu., in 1939-40 at three locations in the Coastal Plain. Carala is recommended in the central and southern Piedmont and throughout the Coastal Plain. In the upper Piedmont, where Carala had not been thoroughly tried and where freezing may be important, Leap, Forward, and Greeson are suggested, and for the Mountain region, where winter injury is still more of a factor, Fulcaster is recommended.

Variation in protein percentage of wheat the result of environment: Moisture, temperature, and soil are important factors in determining quality in wheat, A. F. BRACKEN (*Farm and Home Sci. [Utah Sta.],* 1 (1940), No. 4, p. 9).—Factors indicated and discussed as conducive to higher protein content in wheat include minimum water and high temperatures during ripening, available nitrogen especially during heading and ripening, inclusion of alfalfa or 5 tons or more of manure in the rotation, and the variety. See also earlier notes (E. S. R., 83, p. 770; 84, p. 183).

[Seed and inoculant research] (*Farm Res. [New York State Sta.],* 7 (1941), No. 1, pp. 3, 6).—Legume Culture Tests for 1940, by A. W. Hofer (p. 3), tabulates and discusses results of tests of 61 cultures and lists brands of inoculants for sale in New York State. The Cereal Grains, by L. E. Everson (p. 6), reports wide variations in trueness to variety and in productiveness among 106 commercial stocks of barley and of oats tested in control fields.

Results of seed tests for 1940, B. G. SAKBOEN (*New Hampshire Sta. Bul.* 328 (1940), pp. [1]+35).—Purity and germination percentages are tabulated for 408 official samples of field and forage crop seed collected from dealers in New Hampshire during the year ended June 30, 1940.

Agricultural seed, A. S. LUTMAN (*Vermont Sta. Bul.* [465] (1940), pp. 14).—The germination and purity guaranties and variations therefrom are tabulated and discussed from tests of 543 samples of field crop seed and forage mixtures collected from local dealers in Vermont during 1940.

[Seed and weed investigations] (*New York State Sta. Rpt.* 1940, pp. 37-39).—Brief reports are made on the trueness to variety, germination, and other characteristics of official samples of field crop, vegetable, flower, and tree seed and special seeds mixtures; the progress of control field plantings of seed stocks; and weed seed studies.

Some important Michigan weeds, H. T. DARLINGTON, E. A. BESSEY, and C. R. MEESE (*Michigan Sta. Spec. Bul.* 304 (1940), pp. 216, figs. 94).—Descriptions, including remarks on habitat, distribution, injurious characteristics, and

illustrations are presented for 94 Michigan weeds, together with a list of species by families, a practical determinative key based on most obvious characteristics, a glossary, a bibliography, and an index. Information is also included on how weeds spread and their control by cultural practice, smothering, and chemicals.

A study of weeds [trans. title], I. RIVERA M. and R. BRERON M. (*An. Inst. Biol. [Univ. Nac. Mex.]*, 11 (1940), No. 1, pp. 103-127, figs. 50; *Eng. abs.*, p. 127).—From soil analyses of vacant lots in the outskirts of Mexico City, it was found that large amounts of calcium and potassium rendered them unfit for cultivation. All these soils were moderately rich in total nitrogen but were low in nitrates. The weeds normally most abundant belonged to the Gramineae, Amaranthaceae, Chenopodiaceae, Cruciferae, and Compositae. From this study, these plants are considered as especially adapted to unfavorable conditions.

A devastating weed, E. L. CAUM (*Hawaii. Planters' Rec. [Hawaii. Sugar Planters' Sta.]*, 44 (1940), No. 4, pp. 243-249, pl. 1, figs. 6).—*Mikania micrantha*, a large rank-growing herbaceous vine, abundant in thickets, along roadsides, in uncared-for clearings, and in more open places in forests, recently introduced into Fiji and Samoa, is indicated as a potential pest of major importance if brought to Hawaii. The plant, a native of Central America, is almost pantropic in range.

HORTICULTURE

Progress report on induced parthenocarpy in some horticultural crops, C. Y. WONG (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 158-160, fig. 1).—Seedless fruits from a number of varieties of watermelon, squash, cucumber, and eggplant were obtained by treating stigmatic surfaces or cut styles of the flowers with certain hormones, such as naphthalene acetic acid or acenaphthene. In certain varieties embryoless seeds developed in the fruits resulting from the treatments. In many instances better development was obtained by using a mixture of two or more growth-promoting substances than by using only one.

Extend use of colchicine as plant breeding tool, M. L. RUTTLE and B. R. NEBEL (*Farm Res. [New York State Sta.]*, 7 (1941), No. 1, pp. 10, 15, fig. 1).—The use of colchicine treatment in obtaining polyploid forms of plants is discussed with special reference to new tetraploid snapdragons and marigolds and the use of the chemical in restoring fertility in tetraploids.

[Horticultural studies by the Arkansas Station] (*Arkansas Sta. Bul.* 405 (1940), pp. 23-28).—Reports are presented upon studies by H. Reynolds and J. E. Valle of the effect of rootstocks on grapes, by Valle on factors causing the uneven ripening of grapes, by J. R. Cooper on fertilizers for peach trees, by Valle and Cooper on varieties of peaches, and by V. M. Watts on irrigation of vegetables.

[Horticultural studies by the Colorado Station]. (Partly coop. U. S. D. A.). (*Colorado Sta. Rpt.* 1940, pp. 31, 32).—Brief statements are given on the progress of various investigations including the breeding of onions, orchard fertilizers, rootstocks, and mulches, and factors concerned with winter injury to raspberries.

[Horticultural studies by the Montana Station], F. M. HARRINGTON and W. E. POLLINGER (*Montana Sta. [Blen.] Rpt.* 1939-40, pp. 33, 35, 36, 45-47).—Included are brief reports on studies relating to the use of transplanting and fertilizer treatments to obtain earlier maturity in vegetables; cultural treatment of sweet cherry orchards; effect of boron on the apple, turnip, rutabaga, and potato; testing of strawberry varieties; culture of the strawberry; and varieties of tree and small fruits.

[Horticultural studies by the New York State Station]. (Partly coop. U. S. D. A., Cornell Univ., et al.). (*New York State Sta. Rpt. 1940, pp. 29-31, 31-37, 41*).—There are presented brief reports of progress on the following studies: Variety testing of fruits, the development of new fruits by breeding, cultural management of orchard soils, nutritional requirements of fruit trees, fertilizers for the strawberry, cultural requirements of the blueberry, propagation and introduction of clonal rootstocks, soil and peat mixtures for roses, sources of peach pits for growing seedlings, effect of growth substances on the development of inserted buds, effect of vitamin B₁ on transplanted fruit plants, embryo and fruit development of the peach, interaction of hydrocarbons and plant tissue, interaction of X-rays and plant nucleuses, genetical analyses of synthetic species, fertilizer requirements of orchard trees in the Hudson River Valley, grape culture, pruning and breeding at the Fredonia Vineyard Laboratory, varieties of hops, effects of vitamin B₁ and phytohormones on the germination of seed, and viability of tree and shrub seeds.

[Horticultural studies by the Puerto Rico Station] (*Puerto Rico Sta. Rpt. 1939, pp. 22-25, 26, 27, 40-45, 46, 62-68, 85-90, 93-98, 99, 100-102, figs. 9*).—Among studies, the progress of which is discussed, are the effect on germination of immersing vanilla cuttings in dilute nutrient solutions; the use of *Gliricidia sepium*, *Erythrina berteroana*, and *Bauhinia reticulata* as vanilla-supporting trees; comparison of Columbian and West Indian coffee varieties; culture of cinchona, *Strychnos nuxvomica*, *Cinnamomum burmanni*, nutmegs, cloves, etc.; bamboo propagation and utilization; winter muskmelon production; nutrient requirements of the pineapple; smoking pineapples to induce blooming; propagation, culture, and root development of *Derris elliptica*; selection of *Lonchocarpus*; propagation of the mangosteen; treatment of *Aleurites fordii* with vitamin B₁; effect of yeast extract on the germination and growth of mangosteen seedlings; handling of mangosteen seeds in shipment; the value of *Aloe vera* leaves in the treatment of burns; seed production of chia and perilla; use of treefern fiber for orchid baskets; and the testing of miscellaneous plant materials.

[Vegetable crop studies by the New York State Station] (*New York State Sta. Rpt. 1940, pp. 41-44, 44-48*).—Among studies the progress of which is discussed are the weights of large crop seeds, the occurrence of split seeds in canning beans, fertilizer placement, application of fertilizer solutions at the time of transplanting, boron requirements of canning beets, effect of fertilizers on the anatomical structure of beets and on the firmness of canned tomatoes, comparison of northern- and southern-grown tomato plants, testing of vegetable varieties for canning, factors affecting the acidity of canning tomatoes, breeding of squashes and melons, spacing of sweet corn, and the use of corn plants for supporting pole bean vines.

The vegetable seeds, B. E. CLARK (*Farm Res. [New York State Sta.], 7 (1941), No. 1, p. 6, fig. 1*).—In tests of 49 stocks of Golden Cross Bantam, 56 of red kidney beans, 192 of beets, and 160 of carrots, great variability was observed in the viability of the seed and the uniformity and quality of the plants. In general, the stocks from any single source were comparable in quality irrespective of variety.

Searching for "ideal" snap bean, W. D. ENZIE (*Farm Res. [New York State Sta.], 7 (1941), No. 1, p. 13*).—An examination of experimental packs of new strains of snap beans revealed considerable improvement over existing varieties with respect to form and color of the pod and the color of the seeds.

How seed condition affects stand, W. F. CROSLER (*Farm Res. [New York State Sta.]*, 7 (1941), No. 1, p. 13).—Stating that the field stand of canning beans may be influenced by the size of seeds and the percentage of separated and split cotyledons, the author reports an average of 9 and 11 percent of splitting in lots of Refugee and Kidney Wax, respectively, examined in the 1940 season. The number of seeds per pound for three lots of Improved Kidney Wax was 1,248, 1,450, and 1,570, respectively. A 1-lb. sample of Idaho Resistant Refugee beans had 1,510 seeds.

Some recent yellow sweet corn hybrids, W. D. ENZIE (*Farm Res. [New York State Sta.]*, 7 (1941), No. 1, pp. 1, 7).—Seneca Golden, Sachem, Hybrid 92×28, Golden Cross, and Mohawk are discussed and compared as to yield, maturity, and plant and ear characters. The yields of cut corn per acre were 2,646, 2,723, 2,744, 3,035, and 3,202 lb., and the days from planting to maturity were 82, 90, 95, 96, and 99, respectively.

Effects of heavy applications of dusting sulfur on soil acidity and cover crop in an orchard, W. H. THIES. (Mass. State Col.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 76, 77).—Soil samples collected at a depth of from 1 to 2 in. from beneath apple trees which had been dusted heavily with sulfur were found to range from pH 3.5 to 4.1 as compared with a range of 4.0 to 4.75 in areas distant from the trees. Where samples were collected beneath the tree at 1-, 2-, 4-, 12-, and 24-in. depths, the pH readings were, respectively, 3.5, 3.92, 4.0, 4.2, and 4.22. At some distance from the trees under grass cover the readings at the same depths were 4.1, 4.6, 5.02, 5.0, and 5.3, respectively. Despite the acid conditions the trees were vigorous and produced abundantly, but liming is deemed necessary to promote the heavy development of cover crops.

The effect of root temperature on growth and nitrogen intake of apple trees, L. P. BATJER, J. R. MAGNESS, and L. O. REGENSBAL. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 11-18, figs. 2).—The subjection of the root systems of 1-yr. York Imperial apple trees on French seedling piece roots and growing in sand supplied with nutrient solutions of different N levels to a temperature of 45° F. resulted in the formation of terminal buds. Even where a high N solution was supplied, the foliage showed no increase in N content until after a period of about 4 weeks. Later, translocation of N proceeded rapidly with the greening of the leaves and the renewal of terminal elongation. Trees with roots at low temperature made less growth than comparable trees exposed to greenhouse temperatures.

In another experiment in which the cold chamber was held at 42° there was a greater difference in growth between the two temperature conditions and a definite constriction in diameter below the point where the trunk entered the cold chamber. Low root temperature caused a decrease in transpiration and earlier closing of stomata, making it likely that water shortage may have been partially responsible for the lesser growth in the root-chilled trees. Dormant trees with severely pruned roots made little if any growth when their roots were subjected to 40°. Apparently 40° interfered with translocation of N to the top, since control trees showed significantly more N in their bark.

A preliminary report of experiments designed to limit the amount of fertilization in the apple, F. S. HOWLETT. (Ohio Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 150, 151).—In greenhouse tests the application of 1 to 4 wax emulsion to apple blossoms when they had reached anthesis and before they were pollinated was effective in preventing subsequent pollination. In greater dilutions the wax materials were not effective. The addition of bordeaux mixture to the wax emulsion was helpful in preventing set, except in weak dilutions where the bordeaux broke the emulsion. In the orchard none of the

wax treatments used alone or combined with copper compounds reduced the set significantly, but the author points out that heavy dropping of flowers following bloom may have masked the effects of the treatments.

Growth increment in apple trees, R. L. McMURRY. (Univ. Ill.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 106-109, fig. 1).—While removing trees from the apple variety orchard at Urbana, Ill., opportunity was offered to measure growth on the basis of annual ring increments. Great variations were found between varieties and also between trees within a single variety. There was no indication that any one year was more or less favorable for growth than other years. Averaging all the trees, there was a fairly uniform rate of enlargement after the trees had become well established. In the dry years of 1932, 1934, and 1936 trees laid down more wood than in the preceding year, suggesting that at no time had moisture deficiency been great enough to retard growth. Even where trees were in heavy sod there was no evidence of lesser growth. The trees made somewhat greater growth on their north and east exposures, suggesting more favorable growing conditions. Growth records failed to show any appreciable effect of heavy crops on trunk development.

A comparison of pruned and unpruned apple trees, T. J. TALBERT. (Mo. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 113-115).—Comparing three types of pruning, (1) none, (2) modified leader, and (3) open-center, it was found that the severer the pruning the greater were the dwarfing effects. This was particularly evident in the open-center trees, which required severe cutting. After some years no pruning resulted in much shading and killing of small and medium branches due to the lack of sunlight. In 1939, 16 yr. after planting, the yields averaged 7.51, 12.59, and 6.43 bu. per tree, respectively, with definite indications that the modified leader trees would continue to lead.

What the drouths of the '30s did to apple orchards in the Arkansas River Valley in Kansas, R. J. BARNETT and W. G. AMSTEIN. (Kans. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 116-118, fig. 1).—With an annual rainfall in 1933, 1934, and 1936 of 19.39, 20.33, and 17.56 in., respectively, Kansas orchards suffered disastrously. A survey in 1939 showed the surviving orchards to be composed largely of young trees and to be comparatively small one-man enterprises. Insects, such as clover mites, common red spiders, grasshoppers, and flatheaded apple-tree borers, were major factors in the death of trees. Irrigation would have saved many of the orchards.

The pollen value of 134 apple varieties as determined by germination tests and field trials, L. F. HOUGH. (Cornell Univ.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 133-136).—Data presented on the germinability of the pollen and on the set of fruit obtained following the application of the various pollens on Delicious and Rhode Island Greening flowers showed, in general, a correlation between the viability of the pollen and its value in pollination. Poor germination was observed in the pollen of Turley and Stayman Winesap and other triploids, yet in some cases triploid pollens gave fair sets of fruits. In general, bud sports gave similar results to those secured with the varieties from which they originated.

New fruits for Utah gardens, F. M. COE (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 4, pp. 3, 5, fig. 1).—A number of promising new summer, fall, and early winter apples are briefly described and discussed, particularly with respect to their potential value in Utah.

Response of peach trees to potassium under field conditions, F. P. CULLINAN and J. G. WATCHEL. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 87-94, figs. 2).—In an orchard at Beltsville, Md., located on well-drained Sassafras gravelly loam to sandy loam, K deficiency symptoms were

noted on all plats receiving N alone. The production of a heavy crop accentuated the symptoms. Analysis of the leaves showed 2.5 times as much K in those of potash-fertilized trees as in the nitrogen group. K deficiency symptoms were most noticeable in late summer. Analysis of the leaves showing marked K deficiency showed a K content of less than 1 percent on a dry-weight basis. Although it was possible by K treatments to increase the K content of leaves showing from 1.5 to 2 percent K, it is questioned whether the added K would produce beneficial results. Foliar analysis is believed to be a valuable index to the K needs of peach trees, but it is pointed out that there may be only limited areas in an orchard in need of this element. Tabulated data are presented on the K content of peach leaves collected from orchards in Delaware, Maryland, Michigan, and Virginia.

Response of young peach trees in sand culture to varying amounts of nitrogen, potassium, and phosphorus, J. G. WAUGH, F. P. CULLINAN, and D. H. SCOTT. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 95, 96).—In the spring of 1939 an experiment was conducted involving all possible combinations of three levels of N and K and two of P. The most outstanding differences in growth were associated with N at the various levels, irrespective of the amounts of the other nutrients supplied. An increase in N level resulted in significantly increased growth, even with P and K at their lowest levels, but N effects were greater at the higher P and K levels. The reduction in growth due to inadequate P became greater as the N content of the nutrient was increased. K at the levels used had less direct effect on growth than did N or P. Chemical analysis of the N, P, and K contents of the leaves on a dry-weight basis reflected very consistently the observations on foliar appearance.

Peach tree fertilizer demonstration results, E. H. RAWL (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 85, 86).—Under South Carolina conditions in order to obtain proper development of cover crops, foliage, fruit buds, twigs, and fruit, it was found necessary to supply (in addition to N) P, K, and limestone. Potash appeared to have the least significance, yet abnormal trees were not restored to satisfactory condition without this element.

The Redhaven peach, S. JOHNSTON (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, pp. 93-95, fig. 1).—A description is presented of a promising new peach, developed at the South Haven Horticultural Substation, from a cross of Halehaven by Kalhaven. The fruit ripens about 1 mo. ahead of Elberta, the flesh is yellow, and the stone is free. The exterior color is a bright yellow, usually almost completely covered with brilliant red.

High-bush blueberry culture in Rhode Island, A. E. STENE (*Rhode Island Sta. Misc. Pub.* 8 (1940), pp. [14], pls. 3, figs. 3).—This is a presentation of general information relating to the selection of sites, varieties, pruning, culture, etc.

Late holding of water on cranberry bogs, C. S. BECKWITH (*New Jersey Sta. Cir.* 402 (1940), pp. 4).—Stating that the occasional late holding of water, to July 5-10, has been found an effective and economical means of insect control and for invigorating run-down plants, the author discusses the effects of such treatment on various insects, fruit rot organisms, and weeds. The practice is recommended only for bogs that have become partly exhausted and not for those in a thrifty condition.

The trailing raspberry—*Rubus parvifolius* L.: Characteristics and breeding, C. F. WILLIAMS and G. M. DARROW. (Coop. U. S. D. A. et al.). (*North Carolina Sta. Tech. Bul.* 65 (1940), pp. 13, figs. 4).—This includes a brief description of the species and an account of efforts to improve the fruit by selection and by crossing with the cultivated red raspberry. In plant characters

the hybrids were generally intermediate between the parents. The hybrids varied in resistance to leaf spot from very susceptible to resistant, none equaling the original *R. parvifolius* selections in this respect. The fruit of the hybrids ranged from light to very dark red in color and was usually very acid. The worst features of the hybrid fruits were the small number of drupelets and their crumbling structure. About 40 percent of the hybrids with Taylor, Newburgh, and Latham were self-fertile. Since many of the *R. parvifolius* seedlings are self-sterile, it is suggested that self-sterility in the hybrids may be an inherited character.

Effect of leaf removal and crown covering on the strawberry plant, G. F. WALDO. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 548-552).—Covering strawberry plants with soil from June to September with a view to protection from egg-laying by adult strawberry crown moths reduced yields the following season when drought conditions obtained during the period of covering but not when ample moisture was available. Topping the plants prior to covering did not decrease yields when ample moisture was present. Topping alone increased yields under abundant moisture conditions and had no adverse effects under drought conditions. Covering or topping plus covering is recommended provided soil moisture is adequate.

The use of certain nutrient elements at the time of flower formation in the strawberry, J. H. LONG (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 553-556, figs. 2).—In Aroma plants that had been grown in loam or controlled nutrient cultures the first evidence of change from vegetative to flower cells was noted on October 2 when there was a slight corrugation of the parenchyma tissue of the crown. In Aroma plants grown in white sand supplied with solutions lacking in certain elements, it was evident that N may be withheld as late as 3 weeks prior to the date of approximate flower-bud formation without decreasing the number of flower buds as compared with the full-nutrient lot. Ample P must be added from 4 to 6 weeks prior to the expected date of flower-bud formation. The results with K were not as conclusive, but in general if any of the three elements was omitted there were fewer flower buds formed.

The Massey strawberry, G. M. DARROW and E. B. MORROW. (Coop. U. S. D. A. et al.). (*North Carolina Sta. Bul.* 327 (1940), pp. [3], fig. 1).—A description is offered of a new variety originated as a cross between U. S. D. A. No. 634 (Royal Sovereign × Howard 17) and Blakemore. In eastern North Carolina the fruit ripens a week or 10 days later than Blakemore and because of its beauty, size, firmness, and high dessert quality is considered superior for the fancy trade.

Search for maturity and quality tests for grapes continues (*Farm Res. [New York State Sta.]*, 7 (1941), No. 1, p. 16).—In search of a simple and effective criterion of maturity, the station collected samples of fruit of several varieties of grapes in four producing regions and tested them throughout the ripening season with respect to sugar and total solids contents. Total solids were some 2 or 3 percent higher than true sugar content, but fortunately the difference between the two constituents was nearly constant for any given variety. In the Concord the juice was found to contain, on an average, 2.2 percent more solids than sugars. Total solids determined by the hand refractometer agreed well with those determined by the hydrometer. The locality where grown exerted a profound influence on sugar content, necessitating standards for the different producing areas.

Cambial activity in the Hachiya persimmon, C. J. ARCHER and S. H. CAMERON. (Univ. Calif.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 127-129).—Observations on samples of wood taken at weekly intervals from 9-year-old trees showed swelling of cambial cells by the last week in February in the preceding season's growth, from 1 to 2 weeks later in second-year, and from 3 to 4 weeks

later in third-year growth. No unligified xylem elements were found in sections taken from normal trees after the third week of August, indicating a cessation of cambial activity. The initiation of cambial activity was dependent on bud growth and proceeded basipetally therefrom. Cambial activity ceased more abruptly and more uniformly than it was initiated, and fruiting had little effect on duration but did influence the rate toward the end of the season.

The influence of pollination on seed development in certain varieties of citrus, C. Y. WONG (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 161-164).—The absence of seed in Valencia, Hamlin, Pineapple, and Parson Brown oranges, the pollination of which was prevented by cutting off the filaments and styles before anthesis, suggested that apogamic embryonic seeds required the stimulation of fertilization and pollination or that of synthetic or natural auxins. Especially in naturally seedy types, such as Parson Brown and Pineapple oranges, the number of seed was increased by cross-pollination as compared with self-pollination. The lesser effect of cross-pollination on seed production by Valencia is attributed to hereditary factors for seedlessness in this variety, and the relative seedlessness of Valencia and Hamlin oranges and Marsh grapefruit in solid blocks to the insufficient amount of functional pollen for fertilization. It is believed that the seedlessness of a given variety is governed largely by its hereditary and evolutionary characters.

A preliminary note on nitrogen assimilation by citrus trees, R. H. HILGEMAN, J. G. SMITH, and G. E. DRAPER. (*Univ. Ariz.*). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 58-61, figs. 2).—In the case of Marsh grapefruit trees growing on different soil types in the Salt River Valley, it was found that the application of N was reflected by an increased N content of the leaves within 15 days in some instances. The maximum percentage of N found in mature leaves was approximately 2.35 percent. The rate of assimilation of N was more rapid in early fall and spring than during winter. There was a greater assimilation of N during the winter from calcium nitrate than from ammonium sulfate. The percentage N content of the old mature leaves declined in late winter and early spring just prior to and during new growth and blooming. The N content of leaves on new spring growth was essentially the same regardless of the form of N used or whether applied in September, December, or early March.

Nitrogen nutrition in relation to yield and quality of grapefruit, W. E. MARTIN. (*Univ. Ariz.*). (*Plant Physiol.*, 14 (1939), No. 3, pp. 606, 607).—The experiments reported indicate that a relatively high nitrogen content of the tissue at blossoming time is followed by a relatively large set of fruit, while present evidence suggests that high quality fruit at harvest follows a relatively low N content of the tree during summer and fall and may be materially affected by cultural practices carried out during the growing season. "If present evidence is borne out by further studies, orchard management programs in Arizona could then be planned by considering the seasonal needs of the tree, and nitrogen could be applied when it would do the most good in maintaining production but be withheld or diverted by cover crops during the season of the year when its presence might impair the commercial quality of the fruit."

Some effects of cultural practices upon tree composition, yield, and quality of Marsh grapefruit in Arizona, W. E. MARTIN. (*Univ. Ariz.*). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 68-75, figs. 2).—Supplementing the above article, further evidence is offered to show that the degree of vegetativeness of the tree and the N content of the leaves and twigs of the Marsh grapefruit at different times of the year may be altered by appropriate com-

binations of N fertilization and the use of competing cover crops such as Sudan grass and winter barley. N fertilization in winter together with clean cultivation promoted a high N content in the trees prior to bloom and satisfactory yields. On the other hand, N fertilization in summer plus clean cultivation caused a vegetative condition with coarse-textured fruits of low market quality. Competing cover crops in the summer decreased vegetative growth and increased the proportion of smooth-textured fruits. The most satisfactory system of management from the standpoint of quality and quantity of fruit was winter nitrogen treatment in conjunction with competing cover crops the balance of the year. Data are presented on the N and carbohydrate composition of twigs and leaves of the trees in the several treatments.

The influence of relative humidity on the respiration of papaya at high temperatures, W. W. JONES. (Hawaii Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 119-124, figs. 3).—Papaya fruits were injured severely when subjected to a temperature of 43.3° C. under saturated conditions for a period of 16 hr. or more, but with a relative humidity of 60 percent and a 43.3° temperature visible injury did not occur. The factors causing the differential behavior are not fully clear, but it is suggested that the lower water content of the fruits at 60 percent relative humidity, brought about by increased transpiration, may have been an important factor in preventing injury. Anaerobic conditions are likely more intense in the saturated atmosphere due to decreased gaseous exchange.

Papaya culture in Florida, H. S. WOLFE and S. J. LYNCH (*Florida Sta. Bul.* 350 (1940), pp. 35, figs. 15).—General information is offered relating to the history, botany, uses, flower structure and sex variation, climate and soil requirements, propagation, planting, fertilization, culture, fruit thinning, harvesting and handling, yields, development of new varieties, and the control of insect pests and diseases.

The flower seeds, M. T. MUNN (*Farm Res. [New York State Sta.]*, 7 (1941), No. 1, p. 6).—In 145 samples representing asters, calendulas, marigolds, and zinnias tested in the field there was a wide diversity in germination, varietal purity, vigor of growth, etc. In a few instances the seed was practically worthless, indicating the need of such field tests.

Propagation of ornamental plants, J. V. WATKINS (*Florida Sta. Bul.* 347 (1940), pp. 54, figs. 21).—Propagation is discussed from the standpoint of frames and their management, shading requirements, rooting media, root-promoting substances, water requirements, preparation of cuttings, types of cuttings, division of root clumps, layering, budding, grafting, growth from seeds, and the management of the new plants. In addition, recommendations are presented in tabular form for the propagation of a large number of ornamentals, together with a list of common and botanical names.

FORESTRY

Factors controlling the early development and survival of eastern white pine (*Pinus strobus* L.) in central New England, L. F. SMITH. (Kans. Expt. Sta.). (*Ecol. Monog.*, 10 (1940), No. 3, pp. 373-420, figs. 8).—In studies conducted in the Yale Forest near Keene, N. H., it was observed that overhead canopies of pine stands improved conditions for seedling germination by reducing evaporation from the surface soil. Germination was delayed a few days by the lower soil temperature under shade, but not to a harmful degree. Pine litter was an unfavorable medium for white pine seed germination, especially in direct sunlight. High surface temperature was a major cause of seedling mortality in full sunlight. Under full canopy, soil moisture

was a critical factor for 1-year-old seedlings, as the full canopy and heavy surface litter intercepted a considerable portion of the precipitation. With respect to light, approximately 20 percent of full sunlight was necessary for satisfactory first-year seedling growth, and plants in full light were larger and more vigorous than those in partial shade. Rodents were the major biotic factor in mortality, destroying 13.3 percent of the plants in full shade, 3.1 in part shade, and 1.8 percent in full sun. Insects were not a major factor in seedling mortality. Fungi caused 4 percent loss of seedlings in full shade but were of no significance in the open.

The natural establishment of pine in abandoned fields in the Piedmont Plateau region, W. E. McQUELLEN. (U. S. D. A.). (*Ecology*, 21 (1940), No. 2, pp. 135-147, figs. 7).—Stating that practically all of the abandoned agricultural land in the Piedmont area sooner or later reverts to pine, the author found that the paramount factor affecting the reestablishment of loblolly and shortleaf pines is the presence of an adequate source of seed in the form of nearby parental trees. Site factors, by their influence on available soil moisture, may account for variations in densities of established seedlings or influence the time required to establish stands. With adequate seed sources and fair to good site conditions, reproduction in densities equivalent to 1,000 or more seedlings per acre was recorded to distances averaging about 330 ft. away from the parental trees. Beyond 462 ft. seedling production rarely approached satisfactory densities.

Site factor variations and responses in temporary forest types in northern Idaho, J. A. LARSEN. (Iowa State Col.). (*Ecol. Monog.*, 10 (1940), No. 1, pp. 1-54, figs. 15).—Equipped with weather stations, established on a level area in a larch-Douglas fir forest, on a southwest western yellow pine slope, and on a northeast aspect within the western white pine type, a study was made of various site factors governing the reestablishment of forests following fire, logging, or other denudation. The southwest aspect had the higher daily and seasonal air temperature maxima and the longer duration of temperatures favorable for growth. The minima of the air temperatures were lowest on the flat both winter and summer and highest on the northeast slope.

Soil temperatures reflected and followed the trend of air temperatures, with absolute maxima at the surface of 125°, 100°, and 95° F., respectively, on the southwest, the flat, and the northeast aspects. On the southwest slope, soil moisture reached more critical minima and remained at dangerously low points for extended periods in summer. The soils on the northeast slope contained a greater clay and silt fraction and had higher capillary and other moisture-retaining qualities than those of the southwest slope. The soils of the larch-Douglas fir site were intermediate. Plantings on the several sites as measured by germination, survival, and growth responded in the same manner as existing trees, that is, western yellow pine was practically the only species of six tested to survive on the exposed southwest slope. There was demonstrated an early selectivity of the native species for their more suitable environment.

Watering germinating seedbeds, Y. LI (*Jour. Forestry*, 38 (1940), No. 11, pp. 897-898).—In studies conducted at the Cloquet [Minn.] Forest Experiment Station in which jack and red pine seeds were sown in watertight boxes supplied with different amounts of water, it was noted that the red pine required the more water for germination. Jack pine germinated more rapidly and completed germination sooner than did red pine. A moderate water supply was better than an excessive or scanty amount. Beneficial moisture conditions favored a low top : root ratio by weight and a high top : root ratio on the basis of length.

Soil temperatures during forest fires and their effect on the survival of vegetation, N. C. W. BEADLE (*Jour. Ecol.*, 28 (1940), No. 1, pp. 180-192, pl. 1, fig. 6).—Following the burial at different depths of small glass tubes containing organic materials of known melting point, fires were built on the surface and burned for different intervals. The results indicated that the probable maximal temperature during a severe fire is 111°-114° C. at 1 in. and 59°-67° at 3 in. Under extreme conditions the temperature at 1 in. may exceed 250° and attain 48°-50° at 1 ft. A high percentage of water in the soil retarded the conduction of heat. Fires had no appreciable effect on the physical properties of the soils under study. Seeds were apparently able when dry to resist a temperature of 110° for 4 hr. Seeds with hard coats could withstand immersion in boiling water for as long as 70 min. without complete loss of viability. Plants with lignotubers were rarely killed but put forth new shoots from these organs.

Snow damage to conifer plantations, M. W. DAY (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, pp. 97, 98).—At the Dunbar Forestry Experiment Substation, 10- to 13-year-old blocks of coniferous species were examined following a winter of exceedingly heavy snowfall, totaling 128 in. The damage consisted almost entirely of the breaking away of lower lateral branches below the snow level. In order of decreasing injury were red pine 17.9 percent, white pine 7.3, white spruce 2, Norway spruce 1.2, and Scots pine 0.9 percent. Generally the more severely injured trees were the smaller ones, especially when surrounded by several larger trees.

Some effects of artificial defoliation in pine and larch, F. C. CRAIGHEAD (U. S. D. A.). (*Jour. Forestry*, 38 (1940), No. 11, pp. 885-888).—An investigation with young Asiatic larch, jack pine, and Scotch pine, in which the trees were defoliated in different degrees of severity to simulate insect damage, showed that the complete removal of all the leaves at any time during the growing season or early in the dormant period resulted in death of the trees. The removal of the current year's growth on pines was relatively more injurious than the removal of old foliage, especially after the new growth had developed.

Retarding needle fall on black spruce Christmas trees, R. K. LEBARRON and A. P. SWAYNE (U. S. D. A. and Univ. Minn.). (*Jour. Forestry*, 38 (1940), No. 12, pp. 941-943, fig. 1).—Comparing three treatments, (1) nothing, (2) bases in water, and (3) bases in a solution of malic and citric acids and calcium carbonate, for the preservation of cut Christmas trees placed in a warm dry room, after a preliminary storage period under damp cold conditions, it was found that plain water was the most effective method for retarding needle abscission. The chemical treatment was intermediate between the other two in effectiveness. In a second experiment in which some of the trees were sprayed with wax emulsion, this treatment caused a pronounced yellowing of the needles within a few days. As a practical deduction it is suggested that the placement of the tree base in a container of water is the simplest and most effective way of preserving Christmas trees.

Lumber from old-growth versus lumber from second-growth in *Pinus strobus*, E. M. DAVIS (U. S. D. A. and Univ. Wis.). (*Jour. Forestry*, 38 (1940), No. 11, pp. 877-880).—Comparing second-growth white pine in New England with data taken in the 1922-26 period on old-growth pine cut in Minnesota, the author shows that the second-growth was far inferior in quality. The second-growth material under study produced only about one-fourth as much select and about one-half as much high-common lumber as did the old-growth in Minnesota. However, shake and decay, often the determining defects in old-growth low-common, were almost negligible in the second-growth. Knots were noticeably sounder in the second-growth.

DISEASES OF PLANTS

Abstracts of papers accepted for presentation at the thirty-second annual meeting of the [American Phytopathological] Society, Philadelphia, Pennsylvania, December 27 to 31, 1940 (*Phytopathology*, 31 (1941), No. 1, pp. 1-26).—Abstracts begun on the pages indicated are included: Page 1, The Problem of Controlling Certain Diseases of Forage Grasses by Selection and Hybridization, by O. S. Aamodt, C. L. Lefebvre, and H. W. Johnson; Temperature as a Precision Factor in Chemically Distinguishing *Cronartium ribicola* and *C. occidentale*, by R. J. Acree; Yellowing in Everbearing Progressive Strawberries, by M. M. Afanasiev and H. E. Morris; Some *Fusarium* Wilt Organisms, by G. M. Armstrong, L. Shanor, C. C. Bennett, and B. S. Hawkins (S. C. Expt. Sta. and U. S. D. A.). Page 2, Relation of Vessel Length at Infection Points to Extent of Vascular Invasion in American Elm by *Ceratomyces ulmi*, by W. M. Banfield; A New [Fungus] Leaf Spot and Canker of Gardenia, by J. T. Barrett; Experiments to Control Damping-off in Tomato Seedlings Transplanted From Sand, by W. S. Beach and S. Y. Chan; Shoot Eruptions [of Undetermined Cause] on the Midrib and Petiole of *Nicotiana glutinosa*, by H. P. Beale. Page 3, Hereditary Variation in the Ability of the Clover Leaf Hopper to Transmit Potato Yellow-Dwarf Virus, and Partial Purification of Potato Yellow-Dwarf Virus, both by L. M. Black; Relation of Soil Temperature to *Armillaria* Root Rot in California, by D. E. Bliss; A Method of Determining Loss in Yield Caused by Diseased or Missing Plants and Trials With Leaf Roll of Potato, by F. M. Blodgett, P. Decker, and C. S. Tuthill. Page 4, Peach Mosaic in Western Colorado, by E. W. Bodine and L. W. Durrell; Variations in *Fusarium lini*, by N. E. Borlaug and J. J. Christensen; Wind Dissemination of Angular Leaf Spot of Cotton, by J. G. Brown; The Flexuous Hyphae of *Puccinia graminis* and Other Uredinales, by A. H. R. Buller; Urediospores as the Origin of Systemic Mycelia in *Puccinia suaveolens*, by A. H. R. Buller and A. M. Brown. Page 5, A Fungus Parasite of the Mealy Bug, by V. K. Charles, J. N. Couch, J. G. Harrar, and J. J. McKelvey, Jr.; The Incidence of Purple-Top Wilt in Pennsylvania on Certain Potato Varieties, by O. D. Burke; Custom Operation of the Oklahoma Hot-Water Grain Seed Treater, by K. S. Chester; The Identity and Relationships of Wheat Leaf-Rust Races Collected in Oklahoma in 1939, by K. S. Chester and L. Temple; Loss of Sporulation in *Colletotrichum destructivum*, by S. J. P. Chilton. Page 6, Soil Treatments for Tobacco Plant Beds, by E. E. Clayton, J. G. Gaines, G. M. Stone, and K. J. Shaw; Defoliation of Holly Cuttings by *Rhizoctonia*, by J. S. Cooley; Recent Developments in Methods of Distinguishing [Fungus] Wood Rots, by R. W. Davidson, W. A. Campbell, and E. R. Roth; Anthracnose of *Camellia*, by B. H. Davis and P. P. Pirone; Mechanism of Invasion of Tobacco Leaves by *Bacterium tabacum*, by S. Diachun, W. D. Vallean, and E. M. Johnson. Page 7, Measuring Inoculum Potential and Coverage Index of Sprays, by A. E. Dimond; Bactericidal Efficiency of Sodium Hypochlorite and Other Chemicals Against *Phytophthora scabedonica*, by W. W. Dorrell, E. A. Marten, and J. G. Leach; Factors Influencing the Movement of Viruses in the Potato, by T. P. Dykstra; Bacterial Wilt of Dent Corn, by C. Elliott. Page 8, A Comparison of the Transmission of Four Cucurbit Viruses by Cucumber Beetles and by Aphids, and Insect Transmission, Host Range, and Properties of Squash-Mosaic Virus, both by J. H. Freitag; Strain Combinations of Curly-Top Virus, by N. J. Giddings; Compatibility of Various "Inert Ingredients" With Cuprous Oxide and Calcium Arsenate, by M. W. Goodwin, K. J. Kadow, and D. F. Murphy. Page 9, Smut Resistance in Vegetable Species of *Allium*,

and Use of Hardwood Oils and Other Chemicals in the Control of Onion Smut, both by E. L. Felix; Respiration of Conidia of *Sclerotinia fructicola*, by V. L. Frampton and P. M. Marsh; The Role of Insects in the Pit Scab of Potatoes, by A. A. Granovsky and A. G. Peterson. Page 10, Peach Canker Caused by *Fusicoccum amygdali*, by C. M. Haenseler and R. H. Daines; The Parasitism of Economic Insects by Fungi, by J. G. Harrar, J. J. McKeivey, and J. W. Showalter; Florescence of Potatoes Under Ultraviolet Light for Detecting Ring Rot, by R. B. Harvey; Association of *Bacterium phaseoli* and the Virus of the Common Bean Mosaic—The Effect of Varying Amounts of Nitrogen, by F. Hedges and H. Fisher; Copper Fungicide Tests on Tomatoes, by R. G. Henderson and S. A. Wingard. Page 11, Timing and Dosage of Tomato Sprays for *Alternaria* Control, by J. W. Hueberger; The Biology of *Fomes fomentarius*, by M. T. Hilborn; Mechanical Transmission from Currant to Tobacco of a Virus Identified as *Annulus zonatus* [Tomato Ring Spot], and Microsurgical Studies on the Crown-Gall Organism With Special Reference to the Infection Mechanism in Tomato, both by E. M. Hildebrand. Page 12, Quantitative Measurement of Tobacco-Etch Virus, by F. O. Holmes; Buds as a Factor in the Overwintering of Shot-Hole of Peach (*Phytophthora pruni*), by S. L. Hopperstead and T. F. Manns; Predicting Protective Value of Fungicides in the Laboratory, by J. G. Horsfall, J. W. Henberger, and A. E. Dimond; The Role of Tree Injection in the Control of [*Phytophthora cactorum*] Bleeding Canker of Hardwoods, by F. L. Howard and N. E. Caroselli. Page 13, *Ascochyta majalis* Identified on Lily of the Valley in the United States, by A. E. Jenkins; Transmission of Viruses by the Parasitic Activities of Dodder, by F. Johnson; Ground Sprays Aid in Control of Apple Scab, by K. J. Kadow and S. L. Hopperstead; Experiments With Eradicant Fungicides in Relation to Apple Scab Control, by G. W. Keitt, C. N. Clayton, and J. D. Moore. Page 14, Further Experiments on a Virus Disease of *Prunus cerasus*, by G. W. Keitt and C. N. Clayton; Potato-Ring-Rot Studies in California, by J. B. Kendrick, P. A. Ark, and C. E. Scott; Effect of Cutting-Bench Treatments on the Incidence of Disease in Carnations, by R. S. Kirby; Cure of Aster Yellows by Heat Treatments, by L. O. Kunkel; Bacterial Ring Rot in Relation to the Tomato, by R. H. Larson, J. C. Walker, and S. O. Fogelberg. Page 15, Experimental Production of Invading Overgrowths in Plants, by M. Levine; Bacterial Necrosis of the Giant Cactus, *Carnegia gigantea* (*Cereus giganteus*), by P. C. Lightle, E. T. Standing, and J. G. Brown; Auxinic Activity of Leaves of Cabbage and of *Myzus persicae* Feeding on Them, by G. K. Link, V. Eggers, and J. E. Moulton; Microagglutination of Spores of *Ceratostomella ulmi*, by C. May and J. Zemlansky. Page 16, The Different Toxicity Ratings of Compounds by Different Fungi and Experiments in Spore-Germination Tests of Fungicides, by S. E. A. McCallan, R. H. Wellman, and F. Wilcoxon; Wetting Agents in Relation to the Control of Powdery Mildew of Roses Under Greenhouse Conditions, by W. D. McClellan; Control of *Cercospora* Leaf Spot of Peanut With Proprietary Sulphur Dust, by L. I. Miller; Effect of Fungicides on Quality and Yield of Sour Cherries, by W. D. Mills, F. H. Lewis, and M. Adams. Page 17, An Undescribed [Fungus] Storage Rot of Celery, and Host Range and Overwintering of the Lettuce Shot-Hole or Anthracnose Fungus, *Marssonina panattoniana*, both by A. G. Newhall; Silver Sprays With Promising Fungicidal and Adhesive Properties, by L. W. Nielsen; The Development of a New Method for Determining the Effect of Supplements Upon the Solubility of Copper Fungicides, by A. A. Nikitin. Page 18, Control of Club Root on Cabbage With Mercurials, and Effects of Potash on the Tip Burn of Cabbage, both by R. G. Palmer; Treating Chlorotic Pin Oaks by Trunk Injections and Soil Treatments, by P. P. Pirone;

The Mode of Overwintering of *Entomosporium maculatum* in Louisiana, by A. G. Plakidas. Page 19, Dutch Elm Disease Fungus Prevalent in Bark-Beetle-Infested Elm Wood, by W. H. Rankin, K. G. Parker, and D. L. Collins; A New Virosis of Peach in Utah, Resembling X-Disease (Yellow-Red Virosis), by B. L. Richards and L. M. Hutchins; Growth Substance in Crown Gall Related to Time After Inoculation, Critical Temperature, and Diffusion, by A. J. Riker, H. Berch, and B. M. Duggar; Ascospores of *Ceratostomella ips* and *C. montium*, by C. T. Rumbold; Linkage in Rice of Two Resistant Factors to *Cercospora oryzae*, by T. C. Ryker. Page 20, Development of *Diplodia zeae* and *Gibberella aubinetii* in Maize Pith Following Stalk Inoculations, by G. Semenik; An Eradicant Spray for the Control of Apple Scab and Raspberry Anthracnose in Minnesota, by E. G. Sharvell; A Preliminary Investigation of the Value of a New Seed Protectant for Canning Peas in Minnesota, by E. G. Sharvelle and B. F. Shema; Critical Tests With Crop Rotations for Control of Granville Wilt of Tobacco, by T. E. Smith. Page 21, Successful Cross-Inoculations With *Fusarium* From Tobacco and Sweet Potato, by T. E. Smith and K. J. Shaw; Susceptibility of *Planera* and Several Elm Species to *Ceratostomella ulmi*, by S. J. Smucker; Effect of Nitrogen Nutrition on Virus Inactivation in Tobacco, by E. L. Spencer; Accuracy of the Local Lesion Method for Measuring Virus Activity, by E. L. Spencer and W. C. Price; The Growth of *Basisporium gallarum* in Maize Cobs, by J. H. Standen. Page 22, A Comparative Study of the Chemical Composition and Calorific Value of Decayed Cordwood, F. H. Steinmetz and M. T. Hilborn; A Transmissible Mosaic of American Elm, by R. U. Swingle, P. E. Tilford, and C. F. Irish; Copper Fungicides for Control of Cherry Leaf Spot [*Oocomyces*], by C. F. Taylor; Occurrence, Identification, and Species Integrity of the Loose Smuts of Barley *Ustilago nuda*, *U. nigra*, and *U. mediana*, by V. F. Tapke. Page 23, A Proposed System of Virus Nomenclature and Classification, by H. H. Thornberry; Current Research in the Control of Injurious Rodents, by K. J. Kadow et al.; Experimental Production of Symptoms in So-called Recovered Ring spot Tobacco Plants and Its Bearing on Acquired Immunity, by W. D. Valleau; Studies on Boron Deficiency in Garden Beet (*Beta vulgaris*), by J. C. Walter and J. P. Jolivet; Transmission of the Planetree *Ceratostomella* in Asphalt Wound Dressings, by J. M. Walter and P. V. Mook. Page 24, The Relation of *Bacterium malvacearum* to Anthracnose Boll Rot of Cotton, by R. Weindling and P. R. Miller; Duration of Inhibition of Spore Germination—A Factor in Spore-Germination Tests of Fungicides, by R. H. Wellman and S. E. A. McCallan; A New [Fungus] Turf Disease, by C. C. Wernham and R. S. Kirby; *Phomopsis* Fruit Rot of Tomato, by J. S. Wiant; Varietal Resistance of Wheat to Loose Smut, by S. A. Wingard. Page 25, The Influence of Tobacco-Mosaic Virus on Cellular Oxidation, by M. W. Woods and H. G. duBuy; Fungi Observed in the Trunks of Young Pine Trees in Natural and Artificial Established Forests, and Relative Susceptibility of Young Pine Trees in Artificial and Natural Stands to Various Root, Root-Crown, and Butt Fungus Parasites, both by H. H. York; The Effects of Copper Sprays on Tomato Yields, by P. A. Young. Page 26, The Inheritance of a Leaf Variegation in Beans, by W. J. Zaumeyer; Genetic Studies of Resistance to Six Physiologic Races of Bean Rust, by W. J. Zaumeyer and L. L. Harter.

The Plant Disease Reporter, [December 1 and 15, 1940] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr.*, 24 (1940), Nos. 22, pp. 451-468; 23, pp. 469-505, figs. 3).—The following items of interest to phytopathology are included:

No. 22.—Incidence of potato late blight in 1940; peanut diseases in certain Texas counties in 1940, by G. KenKnight; fall infections of cereal rusts in

Kansas, by C. O. Johnston; and host-parasite check-list revision (*Caryota* to *Casidopsis*), by F. Weiss.

No. 23.—Status of yellow-red virosis (X-disease) of peach and chokecherry in 1940, by E. M. Hildebrand and D. H. Palmiter; X-disease of peaches spreading in Utah, by B. L. Richards; apple tree anthracnose in Illinois, by H. W. Anderson; tomato defoliation diseases, by C. F. Andrus; potato late blight situation in Virginia in 1940, by H. T. Cook; *Phytophthora* bleeding canker and basal canker diseases of maple in New Jersey, by P. P. Pirone; relative susceptibility of rose varieties to black spot (*Diplocarpon rosae*), by E. A. Piester; host index of grass disease in the Pacific Northwest in 1940, by G. W. Fischer; and host-parasite check-list revision (*Castilla* to *Celtis*), by F. Weiss.

[Phytopathological work] (*Arkansas Sta. Bul.* 405 (1940), pp. 37–40, fig. 1).—Brief summaries are included on the present status of studies on the control of cotton wilt and "rust" conducted by V. H. Young and W. H. Tharp (coop. U. S. D. A.); the origin of oats crown rust epidemics, by H. R. Rosen and L. M. Weetman; promising results with spraying of strawberries, by S. B. Locke and Young; and controlling rice diseases, by E. M. Cralley.

[Phytopathological studies by the Colorado Station]. (Partly coop. U. S. D. A.). (*Colorado Sta. Rpt.* 1940, pp. 26, 31, 32).—Brief reports are given on studies of peach mosaic; bacterial ring rot of potato; onion breeding, including the development of resistance to purple blotch and thrips; and the relations of calcium and potassium to chlorosis in stone fruits.

Department of botany and bacteriology, H. E. Morris (*Montana Sta. [Bull.] Rpt.* 1939–40, pp. 20–23, 34).—Studies are briefly reported relative to seedling diseases ("black-root"), phosphate deficiency, and *Fusarium* yellows of sugar beets; and to a potato disease (bacterial ring rot) new to Montana—its identification and control, including a method of tuber selection developed by V. E. Iverson and H. C. Kelley.

Division of plant pathology (*New York State Sta. Rpt.* 1940, pp. 23–28, 39, 40).—Reports of disease investigations include brief notes on copper injury tests on apple, spray stickers, brown rot of peach, peach leaf curl, yellow-red virus or "X" disease of peach, bacterial canker of cherry, diseases of small fruits (raspberries, gooseberries, and currants), bean mosaic severity and control by resistant varieties, tomato leaf blight incidence and control by spraying, pea seed treatment, cabbage yellows control by resistant varieties, *Fusarium* foot rots of peas, diseases (downy and powdery mildews) of hops and the hop-vine borer and their control, lima bean seed treatment, cauliflower black rot studies (coop. Cornell Univ.), and studies of seed-borne fungi and bacteria of various crop plants and their control by chemical means.

Plant-disease investigations (*Puerto Rico Sta. Rpt.* 1939, pp. 68, 69, 117–119, figs. 2).—Brief reports are included on zinc sulfate sprays for minimizing mottle leaf in grapefruit, *Cercospora* leaf spot (Sigatoka disease) of bananas in Puerto Rico, and a serious infectious disease of vanilla of as yet unknown cause.

Descriptions of new fungi causing economic diseases in Scotland, C. E. FOISTER (*Bot. Soc. Edinb., Trans. and Proc.*, 33 (1939–40), pt. 1, pp. 65–68, figs. 14).—Descriptions are given of *Phytophthora verrucosa* n. sp., causing top rot of tomato; and *Phoma foreata* n. sp., causing gangrene disease of potato.

Some problems in handling and interpreting plant disease data in complex factorial designs, W. H. THARP, C. H. WADLEIGH, and H. D. BARKER. (*Ark. Expt. Sta. coop. U. S. D. A.*). (*Phytopathology*, 31 (1941), No. 1, pp. 26–48, figs. 2).—Plant-disease data are frequently expressed as percentages, or on some relative scale of an index system. However, when percentage data are from tests where large differences are secured for certain disease-control treatments,

or where known checks are included, the resultant heterogeneity makes the problem of a reliable error term or of selecting the proper transformation more difficult. This is especially true where the data are derived from experiments of factorial design because the interactions are of considerable interest, yet they are not always to be interpreted with confidence on the transformed scale. This paper, based on experimentation with mineral nutrition of cotton in relation to its susceptibility to *Fusarium* wilt, presents some of these problems in the hope that it may aid others under similar difficulties.

Handbook of virus investigation.—II, Specific viruses as infectious agents, immunity against virus infections, the technic of experimental investigation of phytopathogenic viruses, edited by J. CRAIGIE, R. DOEBB, G. M. FINDLAY, C. HALLAUER, K. M. SMITH, and O. THOMSEN (*Handbuch der Virusforschung*, edited by R. DOEBB and C. HALLAUER. 2. Hälfte, *Die Virusarten als Infektiöse Agentien, die Immunität gegen Virusinfektionen, die Technik der Experimentellen Erforschung Phytopathogener Virusarten*. Wien (Vienna): Julius Springer, 1939, pt. 2, pp. XVI+547-1384, figs. 19).—This is the second contribution in this monograph series, previously noted (E. S. R., 81, p. 523), and concerns both animal and plant viruses.

The identification of certain viruses found infecting leguminous plants in Great Britain. G. C. AINSWORTH (*Ann. Appl. Biol.*, 27 (1940), No. 2, pp. 218-226, pls. 2).—"A survey of the virus diseases affecting leguminous plants in Great Britain was made in order to ascertain whether the virus of lettuce mosaic, to which pea and sweet pea are susceptible, could be related to any other virus able to infect legumes. In the course of the work the viruses, which are briefly described and discussed in this paper, were recognized, but lettuce mosaic virus could not be equated with any one of them. Sweet pea streak disease was found to be invariably associated with virus infection and is, it is thought, a complex of virus diseases. The susceptibility of a range of host plants to the viruses of bean mosaic, mild pea mosaic, yellow pea mosaic, enation mosaic of pea, lettuce mosaic and tomato spotted wilt, a virus able to cause sweet pea streak, and a strain of cucumber virus 1 from sweet pea [is] indicated."

A comparison of the viruses of streak of tobacco and yellow dwarf of potato. W. D. VALLEAU. (Ky. Expt. Sta.). (*Jour. Bact.*, 40 (1940), No. 6, p. 869).—An abstract.

Infection with pure cultures of *Olitocybe tabescens*. A. G. PLAKIDAS. (La. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 1, pp. 93-95, fig. 1).—Early attempts at inoculation with this root-rot fungus of pear and tung trees, using cultures on agar or autoclaved bean pods, failed, possibly due to the rapid disintegration of the media in the soil before the pathogen could invade the roots. Later attempts proved successful, using autoclaved, thick pieces of tung or pear wood, with corn meal and water added before sterilization. This is believed to be the first record of infection from pure-culture inoculations of *O. tabescens*.

Notes on *Cyphella villosa* [trans. title], A. P. VIEGAS (*Inst. Agron. Estado [São Paulo], Campinas, Bol. Téc.* 80 (1940), pp. 7, pls. 5).—The systematic position, morphology, and cytology of this thelephoraceous fungus are considered.

The growth of *Fusarium oxysporum cubense* in the soil. C. H. MEREDITH (*Phytopathology*, 31 (1941), No. 1, pp. 91-93).—The organism spread on greenhouse compost an average of 0.47 cm. per day and on clay subsoil 0.3 cm. per day. It penetrated the loam, silt loam, and silty clay loam soils 0.3-0.37 cm. per day. The penetration in fine sandy loam and coarse sandy loam was 0.5-0.52 cm. per day. Over short periods the daily average surface spread was 0.24-0.6 cm. and the penetration 0.3-0.52 cm.

The British species of *Puccinia* included under "*P. syngenesiarum*" with notes upon the British rust fungi occurring on thistles, M. WILSON (*Brit. Mycol. Soc. Trans.*, 24 (1940), pt. 2, pp. 244-250).—Of 18 specimens of *P. syngenesiarum* examined, 15 proved to be *P. le monnieriana* on *Oniscus palustris*. Mistaken early identification of *C. palustris* for *C. lanceolatus* as host for *P. syngenesiarum* is believed to have led to the erroneous citations of *C. lanceolatus* as a host of *P. cardui* and of *P. cnici-oleracei*. Although type specimens of *P. cardui* have not been examined, this species is believed almost certainly identical to *P. le monnieriana*. Notes on the nomenclature and distribution of 7 other species of *Puccinia* are given, and *P. cirsii-palustris* is given as a new combination for *P. le monnieriana*.

Observations on the cultural and pathogenic habits of *Thielaviopsis basicola* (Berk. & Br.) Ferraris, R. E. RAWLINGS (*Ann. Missouri Bot. Gard.*, 27 (1940), No. 4, pp. 561-598, pls. 3, figs. 10).—Detailed studies here presented of three isolants (one from tobacco in Tennessee, one from *Primula obconica* in the Netherlands, and one from cotton in Texas) indicated them to be distinct physiologic races.

Two little known Argentinian Uredineae: *Bitzeia ingae* and *Uredo ingae* [trans. title], J. C. LINDBQUIST (*Darwiniana*, 4 (1940), No. 1, pp. 129-132, fig. 1).—*B. ingae* on *Inga* spp., and *U. ingae* on *I. uruguensis*.

Two diseases of grasses caused by species of *Helminthosporium* not previously recorded in Britain, K. SAMPSON and J. H. WESTERN (*Brit. Mycol. Soc. Trans.*, 24 (1940), pt. 2, pp. 255-263, figs. 2).—Two species of *Helminthosporium* recorded for the first time in Britain are *H. siccanus* on *Lolium perenne*, *L. multiflorum*, and *Festuca pratensis*, and *H. vagans* on *Poa pratensis*. Single-spore cultures of both were studied, and certain isolations of *H. siccanus* showed slight but consistent variations in cultural characters and in size and shape of conidia.

Physiologic forms of *Ustilago zeae* in various Argentinian localities: Their geographic characterization [trans. title], E. and J. HIRSCHHORN (*Physis*, 18 (1939), No. 50, pp. 181-222, pls. 7, figs. 7).—From the study presented it is concluded that *U. zeae* is to be considered a collective species made up of integrading physiological forms possessing the apparently inexhaustible capacity to vary by mutation. The phenomena concerned and the implications are discussed in detail.

The effects of pH on the cultural characters of corn smut (*Ustilago zeae*) [trans. title], E. and J. HIRSCHHORN (*Physis*, 18 (1939), No. 50, pp. 223-251, pls. 11, figs. 11).

The reaction of oats to different strains of *Ophiobolus graminis*, E. M. TURNER (*Brit. Mycol. Soc. Trans.*, 24 (1940), pt. 2, p. 267).—An abstract.

Tillering and flowering in rice.—III, Some remarks on the susceptibility of the Oentoeng variety (when cultivated on nutrient solutions) for *Piricularia oryzae* Cav. [trans. title], L. W. KULLMAN (*Landbouw [Buitenzorg]*, 16 (1940), No. 8, pp. 465-470, fig. 1; *Eng. abs.*, p. 470).—Under the experimental conditions, the fungus prevented the elongation of the stems and finally killed the plants.

Physiologic specialization of *Puccinia graminis tritici* in Argentina, Chile, and Uruguay [trans. title], J. VALLEGA (*Rev. Argentina Agron.*, 7 (1940), No. 3, pp. 196-220; *Univ. Nac. La Plata, Inst. Fitotec, Santa Catalina, Pub.* 12 (1940), pp. [1]+196-220; *Eng. abs.*, pp. 218, 219).—Seven races were identified, viz. Nos. 11, 14, 15, 17, 21, 36, and 42. Nos. 17 and 42 were most widely distributed and prevalent in Argentina and Uruguay, whereas in Chile No. 15 was generally distributed, 14 was found chiefly in the northern, 17 in the central, and 11 in the southern areas. The prevalence of races attacking durum

wheats is noteworthy. In a collection of 160 wheats, especially Argentinian, Chilean, and North American varieties, tested against 7 races isolated in South America, almost all proved susceptible in Argentina and Chile, but several exceptions noted were resistant to certain of these physiologic races. Several hybrids of Heines Kolben \times 38 M. A. from the Instituto Fitotécnico, Santa Catalina, Argentina, are said to be very resistant to the more prevalent races of stem rust in Argentina, viz. Nos. 42, 17, and 11.

Preliminary investigations on dwarf bunt of wheat, C. S. HOLTON. (Wash. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 1, pp. 74-82, figs. 5).—The reticulate chlamydospores of the dwarf race of *Tilletia tritici* failed to germinate under all laboratory treatments tried, but the smooth, hyaline, haploid resting spores occurring with them often germinated. Monosporidial lines of the dwarf race were obtained by isolating sickle-shape, secondary sporidia produced by the hyaline spores. Some of the single sporidia produced a haploid growth type, whereas others produced an apparently dikaryotic mycelial type, but the former type predominated. The unisexual nature of the monosporidial lines was indicated by the infection obtained from combinations of monosporidial lines and the lack of it from individual lines. Infection resulted in host symptoms and chlamydospore characteristics typical of dwarf bunt. Hybrids between the dwarf race and race 12 of *T. tritici* and race 9 of *T. teris* were obtained by inoculating with combinations of monosporidial lines. There was evidence of segregation for chlamydospore morphology and for dwarfing of the host.

Bacterial wilt of alfalfa and its control, F. R. JONES. (Coop. Wis. Expt. Sta.). (*U. S. Dept. Agr. Cir.* 573 (1940), pp. 8, figs. 3).—This disease appears to be permanently established in alfalfa regions of the country with abundant rainfall or where irrigation is practiced, except in some southern and extreme northern areas. The productive period and life of alfalfa stands are shortened and, though the disease may be somewhat retarded in certain localities by field management, usually stands of long life are possible only by the use of resistant varieties. Several of these are already available, and others are being developed.

Boron deficiency symptoms in some plants of the cabbage family, F. B. CHANDLER (*Maine Sta. Bul.* 402 (1940), pp. [3]+155-187, figs. 35).—In general, boron deficiency causes dwarfing and curled, rolled leaves, often with chlorotic margins. The more specific symptoms are described and illustrated for 11 members of the cabbage family and more briefly for 12 other plant species. This deficiency has been observed in a large number of towns in southern and eastern Maine. It may be corrected by use of 10 lb. of borax per acre, added in the row for row crops. It may be used with the fertilizer, as a side dressing, or as a spray. In setting out plants, boric acid solutions may be used, being poured into the holes in which plants are to be set.

The chemistry of resistance of plants to Phymatotrichum root rot.—VI, Fungicidal properties of fatty acids, N. E. RIGLER and G. A. GREATHOUSE. (Tex. Expt. Sta. coop. U. S. D. A.). (*Amer. Jour. Bot.*, 27 (1940), No. 3, pp. 701-704, fig. 1).—In these further studies (El. S. R., 83, p. 502), the fungicidal properties of 18 saturated and 4 unsaturated aliphatic monocarboxylic acids and the amide of pelargonic acid were tested against *P. omnivorum* in a well-buffered culture medium under controlled conditions. The fungicidal power of the saturated fatty acids increased progressively with increase in the number of C atoms from C_4 to C_{12} and then diminished. None of the saturated acids with 14 or more C atoms was inhibitory at the concentrations used. There was no perceptible difference in toxicity as a result of odd v. even numbers of C atoms. Isobutyric acid was less inhibitory than *n*-butyric and undecylic less so than

undecylenic. Adding the acids to the nutrient solution lowered the pH only slightly. When the medium was made slightly more alkaline by the sodium salts of the acids, the fungicidal power was decreased. It seems apparent that the molecular form is more toxic, and that pH is important only as it affects the ratio between molecules and ions. This work suggests that the possible role of fatty acids in resistance of plants to *P. omnivorum* should be further studied.

Effectiveness and cost of a hop disease control program, R. O. MAEHE (*Farm Res. [New York State Sta.]*, 7 (1941), No. 1, p. 9).—A note summarizing the results of the station's research on hops through which spray and dust programs, at costs not excessive in view of the added returns, have been developed for controlling downy and powdery mildews and sooty mold.

Lightning injury to potato tubers, G. SAMUEL (*Ann. Appl. Biol.*, 27 (1940), No. 2, pp. 196–198, pl. 1).

Pathogenicity studies with isolates of *Rhizoctonia solani* obtained from potato and sugar beet, E. L. LECLEER. (Minn. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 1, pp. 49–61, figs. 2).—In tests of 89 isolates of *R. solani* from underground-stem lesions on older potato plants or from sclerotia on potato tubers, none proved pathogenic to sugar beet roots. Although these isolates were from a very wide geographical range and the results parallel earlier observations, it is possible that by further sampling isolates pathogenic to sugar beets may be found. This view is substantiated by the results of inoculating potatoes with sugar beet isolates, which, in general, were more aggressive on potatoes than the potato isolates used for comparison. Furthermore, isolates have been obtained from potato stolons affected by *R. solani* which in a relatively high percentage rotted sugar beet roots. From potato plants grown in a field with a previous history of sugar beet cropping and severe root rot, two isolates were obtained from potato stems which were strongly virulent to sugar beet roots. A three-season field survey of sugar beet and potato fields showed that sugar beets following potatoes were, in general, relatively free from *Rhizoctonia* root rot, in strong contrast to the situation when sugar beets followed sugar beets. Observational evidence is presented bearing on the desirability of a potato-sugar beet sequence rather than the reverse rotation.

Leaf foot disease of sisal [trans. title], R. DRUMMOND-GONCALVES (*Biologico*, 6 (1940), No. 7, pp. 201, 202).—A note on this disease in the State of São Paulo, Brazil, thought by some to be virus-induced and by others to be due to potash deficiency.

University of Kentucky breeds two new disease-resistant types (*South. Tobacco Jour.*, 54 (1940), No. 9, p. 5).—Tobacco variety No. 16 is said to be an excellent stand-up type and to be extremely resistant to black root rot. No. 48 is probably as good a tobacco but is still in the experimental stage.

Recent research in Ceylon on the frog-eye disease of cigarette tobacco, M. PARK and M. FERNANDO (*Trop. Agr. [Ceylon]*, 95 (1940), No. 3, pp. 131–135).—A review (6 references) of work on the disease due to *Cercospora nicotianae*.

Conidial production in culture by *Cercospora nicotianae*, S. DIACHUN and W. D. VALLEAU. (Ky. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 1, pp. 97, 98).—On plain tobacco agar prepared from the filtrate of chopped and steamed yellow and green leaves of Burley tobacco plants, conidia were produced by 88 of 91 isolates of the fungus. They were normal in shape and size, but the conidiophores differed from those on the leaves in being longer and straighter, with geniculations farther apart, and not clustered. Typical frog-eye spots developed on leaves atomized with conidia produced on tobacco agar.

Varieties of tobacco which localize the virus of common tobacco mosaic (*Nicotiana virus* 1) [trans. title], A. S. COSTA and A. R. LIMA (*Rev. Agr. [Brazil]*, 15 (1940), No. 5-6, pp. 209-213).

Size stability of tobacco mosaic under different conditions, J. W. GOWEN. (Iowa State Col.). (*Genetics*, 26 (1941), No. 1, pp. 153, 154).—An abstract.

Interrelations between mosaic virus and ascorbic acid in tobacco plant, M. I. GOLDIN (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 26 (1940), No. 3, pp. 300-303).—Reduced amounts of ascorbic acid were found in regions of virus activity, but the accumulation of virus showed no correlation with the destruction or delay in development of the chloroplasts and there was no direct connection between the activity of the latter and the vitamin C balance in the plant cells.

Leaf blight of tomato, C. SATTANANDA and M. S. CELINO (*Philippine Agr.*, 29 (1940), No. 4, pp. 365-377, figs. 4).—The history and symptoms are given of a disease in the Philippines shown to be due to a *Helminthosporium* provisionally identified as *H. lycopersici*. The various stages of the fungus are described, and its incidence in 1939 is outlined. All tomato varieties observed showed about the same degree of susceptibility. Pepper and eggplant were only slightly affected, and potato and tobacco not at all.

The angular leaf spot of apple trees, H. WORMALD (*East Malling [Kent] Res. Sta. Ann. Rpt.*, 27 (1939), pp. 63-66, fig. 1).—This disease, first seen in Britain in 1937, was found during 1939 in six localities. The fungi (*Phylosticta* sp. and *Cladosporium* sp.) that were found on the spots are briefly described.

Virus disease of peaches spreading in Utah, B. L. RICHARDS (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 4, pp. 1, 11, figs. 2).—This discusses the symptoms, severity, and present distribution in the State of the X-disease first observed in Utah in 1937.

Cranberry fruit rots in New Jersey, R. B. WILCOX. (Coop. U. S. D. A.). (*New Jersey Stat. Cir.* 403 (1940), pp. 4).—An informational leaflet on these diseases and their control.

Review of research on strawberry virus diseases, 1932-1939, R. V. HARRIS and M. E. KING (*East Malling [Kent], Res. Sta. Ann. Rpt.*, 27 (1939), pp. 66-68).

Suggestions on plant virus nomenclature as exemplified by names for citrus viruses, H. S. FAWCETT. (Calif. Citrus Expt. Sta.). (*Science*, 92 (1940), No. 2398, pp. 559-561).—The author presents a system of nomenclature which he believes would combine the best features of Johnson's (*E. S. R.*, 57, p. 314), Smith's (*E. S. R.*, 78, p. 791), and Holmes' (*E. S. R.*, 82, p. 632) proposals, without the chief objections and difficulties in their use. The proposal is to use binomials as suggested by Bennett (*E. S. R.*, 81, p. 222), but to derive the "genus" from the host as do Johnson and Smith and to use specific names as does Holmes instead of numbers. The rule for the names of "genera" is to add the stem "vir" for virus to the Latin genitive of the genus of the host in which the virus was first discovered and recognized, dropping any final consonants that occur in the genitive.

Symptoms of diseases affecting citrus in Jamaica and suggestions on their control, Z. A. DANIELS (*Jour. Jamaica Agr. Soc.*, 44 (1940), No. 6-7, pp. 274-276, 278).

Observations on citrus diseases in Uruguay [trans. title], H. S. FAWCETT and A. A. BITANCOUER. (Univ. Calif. et al.). (*Rev. Assoc. Ingen. Agrón. [Montevideo]*, 12 (1940), No. 3, pp. 3-8, figs. 7; *Eng. abs.*, p. 8).—The most serious diseases found in the Salto region were foot rot and sweet orange scab. The for-

mer was especially serious, due probably in part to repeated plowing near the trunks which caused many injuries to the large roots. Less important diseases were sour orange scab, crotch disease of tangerine, bacterial leaf spot of sour orange, anthracnose rot, mesophyll collapse decortiosis of lemon bark, endoxerosis of lemon fruit, melanose. *Sclerotinia* twig blight, tear stain, anthracnose, green mold, and brown stain of fruit. Three important diseases present in Argentina but not seen in Uruguay are cankerosis *B. leprosis*, and psorosis.

Notes on *Septobasidium pseudopedicellatum*, cause of the felt disease of citrus in São Paulo [trans. title], A. P. VIEGAS (*Inst. Agron. Estado [São Paulo], Campinas, Bol. Téc.* 79 (1940), pp. 7, pls. 4).—The author briefly considers the economic importance and symptoms of the disease and describes the fungus, including the germination of the probasidia and its dissemination.

Citrus leprosis [trans. title], A. A. BITANCOURT (*Biologico*, 6 (1940), No. 2, pp. 39-45, fig. 1).—A discussion of the occurrence, symptoms, etiology, varietal susceptibility, and control of this disease in the State of São Paulo, Brazil.

Septoria spot of citrus fruits, H. S. FAWCETT and L. J. KLOTZ. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 26 (1940), No. 1, p. 2, fig. 1).—Toxicity tests of various fungicides on the spore germination of the *Septoria* spp. (apparently *S. citri* and *S. limonum* in California) responsible for this spot disease have suggested that thorough covering with bordeaux mixture, zinc-lime, and zinc-copper-lime sprays, and whitewash to which the zinc or copper sulfate materials are added may protect the fruit. Recommended procedures are given.

A case of dodder (*Cuscuta subinclusa* Durand and Hilgard) on valencia orange (*Citrus sinensis* Osbeck) in southern California, G. L. STOUT (*Calif. Dept. Agr. Bul.*, 29 (1940), No. 3, pp. 121-124, figs. 2).

Record of dodder (*Cuscuta subinclusa* Durand and Hilgard) on citrus in Orange County, M. K. BELLUE (*Calif. Dept. Agr. Bul.*, 29 (1940), No. 3, p. 145).

Algal leaf and fruit spot of guava, G. D. RUEHLE. (Fla. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 1, pp. 95, 96, fig. 1).—The alga *Ocephaleuros virescens* is now known to occur on 44 plants in southern Florida, and a complete list would probably exceed 50 species. In most cases its presence causes but little injury, but fruit blemishes on oranges and avocados have been reported. Its parasitism on guava, here briefly discussed, is therefore of special interest. Twig or bark infections on this host are of little concern, but the leaves and fruits are severely attacked and partial defoliation of a Peruvian variety was observed. Spraying with a copper fungicide every 3-4 weeks during the rainy season gave good control in tests of one season.

Anthracnose (Elsinoe) of the Annonaceae [trans. title], A. A. BITANCOURT (*Biologico*, 6 (1940), No. 7, pp. 199, 200).—Note on this disease of *Annona* spp.

A Phytophthora blight of bulbous iris, G. W. GIBSON and P. H. GREGORY (*Brit. Mycol. Soc. Trans.*, 24 (1940), pt. 2, pp. 251-254, figs. 5).—The authors describe a foliage blight of Dutch iris varieties observed in the Isles of Scilly since 1928 and associated with an unidentified *Phytophthora* possibly related to *P. cyperii-rotundati*. Suggestions for control are based on sanitary measures.

Experiments on the control of basal rot of narcissus bulbs caused by *Fusarium bulbigenum* Cke & Mass, with notes on *Botrytis narcissicola* Kleb, L. E. HAWKES (*Ann. Appl. Biol.*, 27 (1940), No. 2, pp. 205-217).—Losses from basal rot in storage were greater at 27° C. (80.6° F.) than at lower temperatures, whereas stocks infected with *B. narcissicola* showed greater losses below 27°. Rapid drying of bulbs after lifting reduced the wastage by *Fusarium*, and partial cleaning soon after lifting accelerated drying and also reduced losses. Reduction of *Fusarium* rot by early planting are attributed to the fact that soil

temperatures in September may be lower than those in the bulb warehouses. The number of bulbs rotting after hot-water treatment for nematodes was reduced by adding formalin or Uspulun or by dipping in a cold solution of formalin following the hot water. Use of certain cold fungicidal steeps and dusts soon after lifting also reduced *Fusarium* wastage, and most of these treatments had no effect on growth or blooming.

Mosaic of roses [trans. title], M. KRAMER (*Rev. Agr. [Brasil]*, 15 (1940). No. 7-8, pp. 301-311, figs. 3; *Eng. abs.*, pp. 308, 309).—A virus disease found in rose plantations of the States of Rio de Janeiro and São Paulo, Brazil, is described and provisionally named "rose mosaic." From the symptoms and experimental results it is suspected that certain virus diseases of roses, and especially the "infectious chlorosis" of the United States, are due to the same virus or to closely related ones. Pale green or sometimes white stripes along the midrib and main veins are said to be characteristic, and ring spots also are present.

Probable virus disease of *Pittosporum daphniphyloides*, D. G. MILBRATH, (U. S. D. A.). (*Calif. Dept. Agr. Bul.*, 29 (1940), No. 3, pp. 158, 159, fig. 1).—A note describing typical mosaic symptoms on *Pittosporum* plants in the U. S. Plant Introduction Garden, near Chico, Calif. A preliminary inoculation test gives strong evidence of the virus nature of the disease.

Black fungus (*Corynelia*) on leaves of *Podocarpus* [trans. title], S. C. ARBUDA (*Biologico*, 6 (1940), No. 7, p. 201).—A note on the disease due to *C. brasiliensis*.

Pests and diseases of trees and shrubs, H. L. CHAMBERS and N. F. THOMPSON (*Wis. State Dept. Agr. Bul.* 213 (1940), pp. 87, figs. 54).

[Leaflets on tree diseases] (*Mass. Forest and Park Assoc., Tree Pest Leaflets* 41 (1940), pp. [4], figs. 2; 44 (1940), pp. [4], fig. 1; 45 (1940), pp. [4], fig. 1; 48 (1940), pp. [4], figs. 5).—Of these leaflets, No. 41 deals with Black Spot Fungus of Elm (*Gnomonia ulmea* (Schw.) Thuem.), by R. P. Marshall (U. S. D. A. et al.); No. 44 with Needle Cast Disease of Pines (*Bifusella*, *Hypoderma*, *Hypodermella*, *Lophodermium*), by J. S. Boyce; and No. 45 with The Sweetfern Blister Rust of Pitch Pines (*Cronartium comptoniae* Arth.), by J. R. Hansbrough, and No. 48 with Sycamore and Oak Anthracnose—*Gnomonia veneta* (Sacc. & Speg.) Kleb, by A. M. Waterman (both U. S. D. A. et al.).

Successful tree inoculation, W. W. WILLIAMS, JR. (*Shade Tree*, 13 (1940), No. 7, pp. [2-4]).—A method of controlling diseases and insect pests by tree injection is proposed. An editorial notation is appended.

Association of *Stereum murrayi* with heart rot and cankers of living hardwoods, R. W. DAVIDSON, W. A. CAMPBELL, and R. C. LORENZ. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 1, pp. 82-87, fig. 1).—Cultures from rots in living yellow and paper birch trees indicated *S. murrayi* to be one of the heart-rotting fungi occasionally present. It was also isolated once each from incipient decay in red maple and from cankers on sugar maple and yellow birch, and sporophores were found associated with trunk cankers and heart rot of ironwood, beech, and striped maple and on logs and dead limbs. Readily isolated from both incipient and advanced decay, it was identified by its characteristic odor and growth habit in culture. It apparently enters living trees through dead branch stubs or trunk injuries.

Chestnut breeding work in 1939, A. H. GRAVES (*Brooklyn Bot. Gard. Rec.*, 29 (1940), No. 2, pp. 58-65).—A further progress report (E. S. R., 81, p. 356), with special reference to chestnut blight.

Blight-resistant chestnuts, G. F. GRAYATT. (U. S. D. A.). (*Pa. Nut Growers Assoc. Rpt. Proc.*, 8 (1940), pp. 17-20).—An address briefly setting forth

the history and present status of the search for and breeding work directed toward the development of chestnuts with the timber and other good qualities of *Castanea dentata* but with the resistance to *Endothia* blight and *Phytophthora* exhibited by some of the Asiatic chestnuts. Of over 5,000 hybrids now under test by the U. S. D. A. Bureau of Plant Industry, some are said to give promise for orchard, forest, or game food purposes but need further trials to determine their full value.

The Dutch elm disease in Connecticut. (Conn. [New Haven] Expt. Sta. coop. U. S. D. A.). (*Science*, 92 (1940), No. 2395, pp. 472, 473).—A brief summary of eradication work and prospects.

Dutch elm disease: New treatment devised to save infected trees (*Florists Exch. and Hort. Trade World*, 94 (1940), No. 25, p. 9, fig. 1).—A note claiming the development of a method of chemically treating infected elms, with rubber playing a vital role in the technic.

A mahogany seedling blight in Puerto Rico, L. A. ALVAREZ GARCÍA. (P. R. Univ. Expt. Sta.). (*U. S. Dept. Agr., Forest Serv., Caribbean Forester*, 1 (1939), No. 1, pp. 23, 24; *Span. abs.*, p. 24).—A sudden epidemic of a foliage blight on 6-month-old trees of *Swietenia mahogani*, symptoms of which are described, was found to be due to *Phyllosticta swietenia* n. sp.

Brown-spot needle disease of pines, F. A. WOLF and W. J. BARBOUR (*Phytopathology*, 31 (1941), No. 1, pp. 61–74, figs. 4).—This study involves the developmental morphology of a fungus causing brown spot needle disease. This disease is seriously destructive to seedlings and young trees of pines, especially *Pinus palustris*, throughout the entire range of the latter. Brown necrotic areas girdle the needles, the portions distal to the lesions becoming dry, the needles dwarfed, and the seedlings stunted or killed. Genetic connection has been established between the conidial stage, properly identified as *Lecanosticta acicola*, and the perithecial stage, *Systremma acicola* n. comb. Viable conidia may be found throughout the year. The acervuli are innate and become erumpent, the conidia being extruded in a matrix, binding them in heaps. The conidia are adapted to distribution by rain splash to longleaf pines in the "grass stage." Perithecia are initiated within stromata bearing spermogonia and carpogonia concurrently. The perithecia mature 6–8 weeks later. Ascospores are disseminated by air currents. Presumably perithecial formation is not controlled by temperature alone. Since the fungus is dothidiaceous and is pigmented throughout, as established by these studies, it is placed in the phaeodidymous aparaphysate genus *Systremma* and is briefly described. It is indicated from studies of its life history and dissemination that the brown spot fungus may best be combated by use of controlled fires.

The function of tannin in host-parasite relationships, with special reference to *Ribes* and *Cronartium ribicola*, H. R. OFFORD (*U. S. Dept. Agr., Bur. Ent. and Plant Quar.*, 1940, E–518, pp. 27).—After a review on the chemical properties, function in plants, and influence of tannins on host-parasite relations and the physiologic nature of host-parasite relations in white pine blister rust, data on the tannin content of several western American species of *Ribes* are summarized along with qualitative tests on tannins, the histology of their distribution, and microchemical tests for tannins. Evidence is presented that their chemical properties and degradation products, their probable function, and their action on parasitic fungi lend themselves to an explanation of the specificity of host-parasite relationships. A theory is offered which postulates a toxic action of tannin initiated and conditioned by enzymes or hormones secreted by the fungi. The ultimate toxicity of the tannins appears to depend partly on the type of phenolics and other potentially toxic constituents formed by the host-parasite

reactions, and partly on the quantity and manner of distribution of the tannin mass. The seasonal tannin content was determined for leaves, current-season stems, roots, and old stems of *R. petiolare*, *R. inerme*, *R. viscosissimum*, *R. lacustre*, *R. nevadense*, and *R. roezli*. In general there was an increase up to the middle of the growing season, the amounts being largest in the leaves and decreasing in the other parts in the order named. The quantity of tannin per se could not be used alone to determine the susceptibility of *Ribes* to blister rust. A study of the decomposition products of the tannin mass of *R. petiolare* (highly susceptible) and *R. inerme* (moderately susceptible) showed the latter to contain more of the catechol tannins, which probably contributed to a higher specific toxicity to the fungus than those of *R. petiolare* which were predominantly of the gallotannin type. Differences were also noted in the ratio of alcohol to water-soluble tannins between *R. petiolare* and a group of less susceptible *Ribes* (*R. inerme*, *R. lacustre*, and *R. viscosissimum*). In leaves of *R. petiolare*, *R. inerme*, and *R. lacustre* the tannins were concentrated in epidermal layers and around vascular bundles. There are 59 references.

Last minute information on [Ceratostomella] plane tree disease, J. M. WALTER. (U. S. D. A.). (*Shade Tree*, 13 (1940), No. 11. pp. [4-6]).

The nematode parasites of plants catalogued under their hosts, T. GOODEY (*St. Albans, Eng.: Imp. Bur. Agr. Parasitol.*, 1940, pp. [3]+80).

On the stem and bulb eelworm (*Anguillulina dipsaci* Kühn) with special reference to its occurrence on weeds of arable land, L. R. JOHNSON (*Ann. Appl. Biol.*, 27 (1940), No. 2, pp. 248-251).—Field observations showed the widespread occurrence of *A. dipsaci* on *Galium aparine* and *Stellaria media* in nematode-infested oats and on the former in crops of infested field beans. The infestations persisted on these weeds under nonsusceptible rotations. Infection tests indicated that strains of *A. dipsaci* on oats and field beans are reciprocally infective, and that the weed hosts are capable of infesting the crop hosts and vice versa. Experiments proved that the rhubarb strain, which readily infests oats and chickweed, is capable also of transference to field beans.

Ethylene chloride for soil sterilization against nematodes, B. G. CHITWOOD. (U. S. D. A.). (*Florists Exch. and Hort. Trade World*, 95 (1940), No. 11, p. 9).—A note on recent experiments indicating that ethylene chloride promises to be a highly effective and less expensive chemical than chloropicrin for ridding soil of the bulb-and-stem nematode and the root knot nematode, having shown excellent results both alone and with chloropicrin.

ECONOMIC ZOOLOGY—ENTOMOLOGY

Nomenclator zoologicus: A list of the names of genera and subgenera in zoology from the tenth edition of Linnaeus, 1758, to the end of 1935, I-IV, edited by S. A. NEAVE (*London: Zool. Soc. London*, 1939, vols. 1, pp. XI+957; 2, pp. [4]+1025; 1940, 3, pp. [4]+1065; 4, pp. [4]+758).—This work, which constitutes an attempt to give as complete a record as possible of the bibliographical origin of the name of every genus or subgenus in zoology that has been published, in works not excluded by the International Commission on Zoological Nomenclature, since 1758 up to the end of the year 1935, appears in four volumes, as follows: Volumes 1, A-C; 2, D-L; 3, M-P; and 4, Q-Z and supplement.

[Work in economic zoology and entomology by the Puerto Rico Station]. (Partly coop. U. S. D. A.). (*Puerto Rico. Sta. Rpt.* 1939, pp. 25, 45, 49-62, 90-93, 102-117, figs. 7).—The work of the year referred to (E. S. R., 82, p. 506) includes a study of the damage to vanilla by *Ecpantheria icasia* Cramer and *Brythrina*

spp. by *Terastia meticulosalis*; control of the scale insects *Asterolecanium bambusae* Bdv. and *A. miliaris* Bdv. on bamboo by introduced predators, particularly two coccinellid beetles (*Egus platycephalus* Muls. from Cuba and *Curinus* sp. from Martinique); an experiment with annual teosinte (*Euchlaena mexicana*) to determine its susceptibility to the lesser cornstalk borer; experiments with various methods and insecticides for the control of corn ear pests (the corn earworm, the fall armyworm, and the corn-silk fly *Euxesta stigmatias* Loew), the chief limiting factor in commercial sweet corn production; studies of the injury to lima beans by the leafhopper *Empoasca fabalis* DeLong; tests with acetone extracts of roots of *Lonchocarpus* plants to determine their toxicity to the housefly and with other insecticidal plants, i. e., *Derris* spp., *Piscidia piscipula*, and *Tephrosia toxicaria*; collection of new physiological races of three species of parasites (*Metagonistylum minense* Tns., *Theresia claripalpis* (V. d. W.), and *Bassus stigmaterus* (Cress.)) which attack the sugarcane borer in São Paulo, Brazil; parasitization of the sugarcane borer by *M. minense* in São Paulo and the hyperparasitization of the latter by *Trichopria* sp.; receipt of new strains of sugarcane borer parasites from Brazil; the rearing in the laboratory of the São Paulo strains of *M. minense* and *Theresia claripalpis* and liberations of the former at Guayama and of three adults of *B. stigmaterus* from Brazil at Santa Isabel; the rearing and liberation of the Amazon strain of *M. minense*, its establishment in the vicinity of Santa Isabel and in the Añasco Valley district, and shipment to Trinidad and Louisiana; the rearing and liberation of *T. claripalpis* from Trinidad; receipt of the European corn borer parasite *Macrocentrus gifuensis* Ash. for trial against the sugarcane borer; the rearing, liberation, and recovery of the ladybeetle *Coelophora inaequalis* (F.), a predator of the yellow sugarcane aphid *Sipha flava* Forbes; shipment of the fruitfly pupal parasite *Dirhinus gifardii* Silv. to the Dominican Republic; introduction from Trinidad and Brazil of new species of beetles predaceous on scale insects; liberations of bamboo scale predators at Bayamon and Mayaguez and of *Hyperaspis bellotti* at Rio Piedras; establishment of introduced species of scale predators (*Ohillocorus cacti* L., *Curinus* sp., *Egus platycephalus*, *Pentilia castanea*, *Azya trinitatis* Marsh., and *Cryptognatha nodiceps* Marsh.) and their redistribution to new areas; shipments of predatory coccinellid beetles (*C. nodiceps*, *P. castanea*, *P. egena*, and *A. trinitatis*) to Florida and Hawaii for liberation against the coconut scale *Aspidiotus destructor*; the rearing and liberation of the pineapple mealybug parasite *Anagyrus coccidivorus* Doz. and its recovery at Lajas; recovery and redistribution of the pineapple mealybug parasite *Hambletonia pseudococcina* Comp.; establishment of *Pseudophycus utilis* Timb., a parasite of the coconut mealybug, from Hawaii; shipment of *Dasyscaphus parvipennis* Gahan, a parasite of thrips, to Florida; tests with several species of bamboo to determine their susceptibility to the powder-post beetle *Dinoderus minutus* F.; a lepidopterous predator (*Kearfottia* n. sp.) found abundant and well distributed on old infestations of bamboo scales (*Asterolecanium bambusae* and *A. miliaris*); tests on the comparative effectiveness of two protective seed treatments, etc., against the coconut rhinoceros beetle *Strategus quadriveatus* Beauv., *Tephrosia* insecticidal plants found attacked by a new species of leaf miner *Phyllonorycter* n. sp. and the rearing of two species of parasites (*Zagrammosoma* n. sp. and *Blackerius* n. sp.) thereon; destruction of native red cherry by a chrysomelid beetle, *Leucocera laevicollis* Ws.; and the finding of a parasitic copepod, *Lernaea carassii* Tidd, first recorded from Puerto Rico, as the cause of the death of goldfish.

Shrubs for wildlife on farms in the Southeast, V. E. DAVISON (*U. S. Dept. Agr. Leaflet 200* (1940), pp. [6], figs. 5).—A discussion of the importance and use of shrubs as a means of protection and a source of food for wildlife where fields and woodlands meet, in hedges, and on steep slopes, rocky outcrops, stream banks, and drainageways.

Wild animal damage to seed and seedlings on cut-over Douglas fir lands of Oregon and Washington, A. W. MOORE (*U. S. Dept. Agr., Tech. Bul. 706* (1940), pp. 28, figs. 14).—This discussion applies to the Douglas fir region in Oregon and Washington where an enormous quantity of debris remains on the logged-over areas after removal of salable logs. The disposal of such slash by fire after logging operations destroys desirable replacement young growth, and recurring fires cause additional destruction. Such fires do not remove many of the small animals which depend partly upon forest-tree seeds for food. White-footed mice (*Peromyscus* spp.) are the commonest and heaviest of these seed consumers. In live-trap studies, occurrence of *Peromyscus* over the winter period on two burned slash sites, each 200 ft. square, was 34 and 35 individuals, respectively. The animals were numbered and their travel recorded. Shrews are numerous in the moist coastal area and are also seed consumers. Squirrels are of little importance from the forest regeneration angle. Douglas fir, hemlock, Sitka spruce, and western red cedar seeds are preferred in the order listed. Artificial reforestation by planting of nursery grown stock, mainly 2-year-old Douglas fir, is retarded by cropping by rabbits common to the area. Mountain beavers, pocket gophers, bears, grouse, and porcupines also contribute to retardation of plantations. The animal instrumental may at times be determined by the type of injury. Port Orford cedar, a valuable and desirable species, suffers but little and is apparently avoided. Efforts to develop indices of damage have thus far been unsuccessful.

A more effective method of orchard mouse control, H. J. SPENCER (*Ill. State Hort. Soc. News Letter 7* (1940), pp. [1, 2]).—A recently developed rodenticide employing zinc phosphide as the lethal agent has proved superior to past and present existing poisons or rodenticides in the orchard. Apple has proved to be the best food bait, with sweetpotato and carrot second and third in choice.

Some studies of *Peromyscus* and other rodents in the San Bernardino Mountains of California, 1937 to 1940, S. E. PIPER and E. JOHNSON (*Calif. Dept. Agr. Bul., 29* (1940), No. 3, pp. 131-145, figs. 2).—Report is made of studies directed toward development of dependable supplemental and alternate toxic baits and satisfactory procedures for their use in control of the several species of white-footed mice, of importance in the spread of sylvatic plague.

A collection of the ecto- and endo-parasites associated with domestic animals in Kedah during the past few years, R. S. NARAYANAN (*Indian Vet. Jour., 17* (1940), No. 2, pp. 77-83).

Two new species of trematodes (*Apharyngostrigea bilobata*: Strigidae, and *Cathaemasia nycticoracis*: Echinostomidae) from herons, with a note on the occurrence of *Clinostomum campanulatum* (Rud.), O. W. OLSEN. (Minn. Expt. Sta. et al.). (*Zoologica* [New York], 25 (1940), No. 3, pp. 323-328, pl. 1).

Preliminary studies on parasites of upland game birds and fur-bearing mammals in Illinois, W. H. LEIGH (*Ill. Nat. Hist. Survey Bul., 21* (1940), Art. 5, pp. [41]-185-194, figs. 5).—Studies of parasites of the greater prairie chicken, bobwhite quail, ring-necked pheasant, opossum, red fox, raccoon, skunk, and muskrat in the upland of Illinois are reported.

[Notes on economic insects and their control] (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 942-952, figs. 3).—The contributions presented (*E. S. R.*, 84, p. 357) are: Insecticidal Properties of the Fruit of *Phellodendron* spp., by H. L. Haller (p. 941) (U. S. D. A.); The European Pine Shoot Moth in British Columbia, by W. G. Mathers and H. F. Olds (p. 941); Three Additional Species of Aphids [the Rosy Apple Aphid, Black Cherry Aphid, and the Pea Aphid] Transmitting Narcissus Mosaic, by F. S. Blanton and F. A. Haasis (p. 942) (U. S. D. A. and Cornell Univ.); A Portable Dusting Tent, by C. H. Martin (pp. 942, 943) (Ohio Expt. Sta.); Establishment of the Codling Moth on Stone Fruits in California, by R. H. Smith (p. 944) (Univ. Calif.); Mosquito Collections at Brownsville, Texas, by F. W. Fisk and J. H. Le Van (pp. 944, 945); A Seed-Infesting Psocid [*Lepinotus patruelis* Pearman] New to North America, by E. O. Essig (p. 946) (Univ. Calif.); Chloropids Swarming in Houses, by C. W. Sabrosky (pp. 946, 947) (Mich. State Col.); Observations on the Biology of the Elm Leaf Beetle Parasite *Erynnia nitida* R.-Desv., by S. E. Flanders (pp. 947, 948) (Calif. Citrus Sta.); The Establishment in British Columbia of Parasites of the Holly Leaf Miner (*Phytomyza ilicis* Curtis), by W. Downes and H. Andison (pp. 948, 949); Infestation of a High School by *Oeciacus vicarius* Horv., by G. A. Mail (p. 949); Mediterranean Flour Moth Breeding in Comb of Honeybee, by E. O. Essig (pp. 949, 950) (Univ. Calif.); Plum Curculio Adults Survive Low Temperatures in the South, by O. I. Snapp (p. 950) (U. S. D. A.); The Use of Calcium Cyanamid in the Control of the Pear Thrips (*Taeniothrips inconsequens* Uzel) in Prune Orchards, by E. P. Breakey, G. A. Huber, and K. E. Baur (pp. 950, 951) (Western Wash. Sta.); A New Species of Leafmining Sawfly [*Fenusa* n. sp.] Attacking Violet, by F. R. Shaw (p. 951) (Mass. State Col.); and Corn Ear Worm Hibernates in Washington State, by R. B. Eichmann (pp. 951, 952) (Wash. Sta.).

[Work in economic entomology by the Colorado Station], J. L. HOERNER and L. B. DANIELS. (Partly coop. U. S. D. A.). (*Colorado Sta. Rpt.* 1940, pp. 2J-26).—The work of the year (*E. S. R.*, 82, p. 791) relates to the harlequin cabbage bug, tomato psyllid, tomato fruitworm, Say's stinkbug on potatoes, insecticide tests with cucurbit insects, and psyllid resistance in potatoes.

[Work in economic entomology by the Montana Station], H. B. MILLS (*Montana Sta. [Bien.] Rpt.* 1939-40, pp. 26-28).—Brief reference is made to the relation of tillage to grasshopper population, the sugar beet webworm, and insect transmission of bean diseases.

[Work in economic entomology by the New York State Station]. (Partly coop. U. S. D. A.). (*New York State Sta. Rpt.* 1940, pp. 19-23).—The work of the year (*E. S. R.*, 82, p. 355) briefly reported upon includes early spring treatments, applications during the growing season, and biological control for the suppression of aphids, oystershell scale, scurfy scale, San Jose scale, bud moth, fruit tree leaf roller, European red mite, and codling moth, particularly on apple; colonization of *Tiphia vernalis*, *T. popilliarum*, and the milky disease for control of the Japanese beetle; rotenone sprays for the cherry maggot; biological control of the oriental fruit moth on peaches and spraying with arsenicals for its control on quinces; the oil deposit from sprays; and experiments with insecticides for the control of insects attacking vegetables, particularly the European corn borer, pea aphid, pea weevil, Mexican bean beetle, and asparagus beetle, and for the control of insects affecting ornamental and nursery plants, including the spruce gall aphid, viburnum aphid, oystershell scale (ilic form), pine leaf scale, common red spider, and the elm leaf beetle.

Insects affecting greenhouse plants, A. GIBSON and W. A. ROSS (*Canada Dept. Agr. Pub.* 695 (1940), pp. 88, figs. 53).—A practical work arranged according to the nature of the attack, namely, leaf eating, sucking, boring, and root destroying, and pests other than insects.

Curculionidae, Bruchidae, Lepidoptera, and their parasites infesting the seed pods of cowpea and various wild plants, T. L. BISSELL. (Ga. Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 847-847, fig. 1).

How to know and control stored-grain insects, M. D. FARRAR, T. F. WINBURN, and W. P. FLINT (*Ill. Agr. Col. Ext. Cir.* 513 (1941), pp. 16, figs. 18).—A practical account contributed by the Illinois Experiment Station in cooperation with the State Natural History Survey and the U. S. D. A. Bureau of Entomology and Plant Quarantine, replacing Circulars 499 (E. S. R., 80, p. 806) and 497 (E. S. R., 82, p. 509).

Livestock sprays: A rapid method for determining their toxicity, C. EAGLESON. (U. S. D. A.). (*Soap and Sanit. Chem.*, 16 (1940), No. 7, pp. 98-99, 117, figs. 6).—Description is given of a technic for assaying the insecticidal power of livestock fly sprays in which emphasis is placed on the provision of forced ventilation of the insects during spray application and the observation period. From 14 to 20 percent less mortality was observed among houseflies when well aerated after spraying than when protected from currents of air (as when placed in screen cages having solid bottoms). Examples of results of the method of assay are given. It is indicated that a chemical assay of a toxicant is not an entirely adequate or dependable index of toxicity for livestock sprays.

Insecticide dispersion: A new method of dispersing pyrethrum and rotenone in air, W. N. SULLIVAN, L. D. GOODHUE, and J. H. FALES. (U. S. D. A.). (*Soap and Sanit. Chem.*, 16 (1940), No. 6, pp. 121, 123, 125, figs. 2).—Housefly tests with an aerosol produced by spraying safrol solutions of rotenone and pyrethrum oleoresin, alone and in combination, on a hot plate at 375° C. were conducted. "The test flies were liberated in a 1,100-cu. ft. room and subjected to 1-hr. exposure. In no test was a mortality of less than 74 percent obtained after 72 hr., and with the rotenone-pyrethrum mixture a kill of 95 percent was obtained. However, similar tests with the American cockroach showed little or no toxic effect. A mortality of 99 percent was obtained when adult *Culex* mosquitoes were exposed for 10 min. to the aerosol produced in a similar way from an ethyl alcohol solution of the pyrethrum."

An improved method of applying insecticidal dusts, A. G. GALLOWAY and A. F. BURGESS. (U. S. D. A.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 912-915, fig. 1).—Description is given of a method of dispersing insecticidal or fungicidal dusts with liquid adhesives so that a uniform controlled dispersion rate may be maintained under varied conditions and adherence of the finely divided particles of insecticides to foliage may be obtained. The principle involved in this method is such that the process may be used in conjunction with aircraft in combating insects or plant diseases, or it may be adapted for use with relatively slow-moving ground equipment of the type generally used in the treatment of truck and orchard crops.

The ratio of lead to arsenic in spray residues from lead arsenate, II, G. W. PEARCE and A. W. AVENS. (N. Y. State Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 918-920).—A reinvestigation of the weathering of spray deposits (E. S. R., 80, p. 369), made during the season of 1939, is reported upon. "No changes in the ratio of lead to arsenious oxide in spray residues from lead arsenate alone were observed. The addition of lime to lead arsenate sprays produces conditions which tend to result in an increase in the ratio of Pb to As_2O_3 after more or less prolonged periods of weathering. The presence of materials, such as bordeaux mixture, Coposil, and aluminum sulfate, which can act as arsenical injury correctives tends to suppress any changes in the lead arsenate spray deposits brought about by lime or other materials having an opposite effect. Oil sprays applied with or following lead arsenate sprays also tend to suppress any changes in the composition of the residues. As the num-

ber of lead arsenate cover sprays applied is increased, the ratio of Pb to As_2O_3 in the residues at harvest tends to approach that in di-lead arsenate."

A method for determination of oil-spray residue on citrus foliage, W. EBELING. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 900-904, figs. 6).—Description is given of a method employed in the spraying of citrus leaves in the laboratory and the determination of oil spray residue according to a simple and rapid technic involving the absorption of the oil off the upper surfaces of the leaves with filter paper and the subsequent extraction of the oil from the paper.

A colorimetric method for the determination of oil deposit on citrus leaves, G. L. MCCALL and J. F. KAGY. (Calif. Citrus Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 905-908).—A rapid, simple, and accurate colorimetric method for the determination of oil deposited on citrus leaves by spray oil, which can be used over a wide range of oil concentrations, is described. It consists in the staining of the spray oil with Sudan III. "After the dyed oil has been sprayed as an emulsion the deposited oil is washed from the leaves with a highly refined light distillate oil or odorless kerosene found to be a satisfactory solvent for removing the spray oil from the upper surface of citrus leaves. The amount of oil deposited is determined by comparing the color intensity of the unknowns with a set of color standards prepared from the dyed spray oil in question. The recovery of oil from leaves by the use of the colorimetric method averages 98.41 percent, and the laboratory oil deposit determinations show an average coefficient of variation of 5.38 percent. The standard error, in percent of the mean, varies from 1.88 to 3.07 percent. An amount of oil as low as 19 mg. was determined from a sample of 25 leaves. Plant waxes and essential oils do not appear to affect the accuracy of the method."

Studies on foodstuffs fumigated with methyl bromide, H. C. DUDLEY, J. W. MILLER, P. A. NEAL, and R. R. SAYERS (*Pub. Health Rpts. [U. S.]*, 55 (1940), No. 49, pp. 2251-2275, figs. 4).—Description is given of a method of analyzing fruits and vegetables for total bromides following fumigation with methyl bromide for insect pests. The results indicate that the amount of methyl bromide (determined as bromide) absorbed by the produce during fumigation is several times the normal bromide content. In most cases the fumigated material showed a drop in bromides after aeration. Dried fruits, fresh fruits, and vegetables absorbed minor quantities of the fumigant, but greater amounts were absorbed by milled grains, cheese, nuts, and nut meats. The adsorptive capacity of milled grains is due primarily to their greater surface area, while the oily and fatty foods absorb large quantities of methyl bromide because of its solubility in fats. The lack of appreciable systemic pathological findings in animals fed foodstuffs fumigated with 3 lb. of methyl bromide per 1,000 cu. ft. is considered significant. Since the diets fed to the test animals (rabbit and rat) reported upon consisted entirely of fumigated foodstuffs, all of which contained more methyl bromide than if fumigated commercially, it is considered unlikely that the small amount of methyl bromide or bromide residues on commercially fumigated fresh vegetables and fruits, or dried fruits, is harmful to the consumer.

Barium compounds as poisons in firebrat baits, C. H. RICHARDSON and E. J. SEIFERLE (Iowa Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 857-861, fig. 1).—Of 26 barium compounds tested for mortality to the firebrat, the 5 found most toxic are placed in three groups on the basis of mortality in 96 hr., namely, barium fluosilicate and barium carbonate, followed by barium oxalate and then by barium peroxide and barium triphosphate. The difference

between the last two groups may not be significant. At concentrations of 4 and 8 percent, barium carbonate produced approximately the same mortality as sodium fluoride and it possessed little, if any, repellent effect, while sodium fluoride rendered the bait noticeably repellent. No significant sex differences in mortality were observed in these experiments. A practical bait containing barium carbonate as the toxic ingredient is described.

Some reactions of grasshoppers to castor bean plants, L. A. SPAIN. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 14 (1940), No. 4, pp. 353-357, pl. 1).—The experiments reported have failed to show that castor beans have any direct value in grasshopper control or as a measure of preventing grasshopper damage to crops.

Preliminary studies on the use of dinitro-*o*-cresol dusts in grasshopper control, G. C. DECKER and C. J. DRAKE. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 14 (1940), No. 4, pp. 345-351).—Experimental findings in Iowa suggest the possibility of obtaining good kills of grasshoppers in a comparatively short time with a 10 percent 3,5-dinitro-*o*-cresol dust applied at the rate of from 10 to 15 lb. per acre.

Taxonomic and biological studies on the Cyrtacanthacrinae of South China, E. R. TINKHAM (*Lingnan Sci. Jour.*, 19 (1940), No. 3, pp. 269-382, pls. 7).—Forms of the orthopteron family Cyrtacanthacrinae occurring in South China. 54 in number, are dealt with, part 1 relating to taxonomic studies and part 2 to biological studies. Six genera are erected and 15 species described as new.

The resistance of corn to the migratory grasshopper *Schistocerca paranensis* [trans. title], A. H. MARCHIONI (*An. Inst. Fitotec. Santa Catalina*, 1 (1939), pp. 159-166, figs. 2; *Eng. abs.*, p. 166).

Residual poison sprays against the onion thrips on carnations, R. D. EICHMANN. (Wash. Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 926-932, figs. 2).—In control work with the onion thrips, a serious pest of greenhouse carnations in eastern Washington, tartar emetic 2 lb. with brown sugar 4 lb. in 100 gal. of water was found the best residual poison spray combination tested. Nicotine sulfate with molasses or karaya gum and paris green with brown sugar are of some value but inferior to tartar emetic.

Thrips attacking citrus fruits in Florida, W. L. THOMPSON. (Fla. Expt. Sta.). (*Citrus Indus.*, [21] (1940), [No. 10], pp. 5, 8, 9, 12, 13, 17, figs. 7).—A Florida flower thrips *Frankliniella cephalica bispinosa* (Morg.), *Ohaetona-phothrips orchidii* (Moul.), the greenhouse thrips, and citrus thrips are considered.

The thrips-transmitted bronze disease of the tomato [trans. title], L. BONNEMAISON (*Ann. Épiphyt. et Phytogénét.*, n. ser., 5 (1939), No. 3, pp. 267-308, figs. 22).—The onion thrips, vector of the virus of the so-called bronze disease of the tomato, is dealt with at some length in this report, which is presented with a four-page list of references to the literature.

Citrus thrips damage on Chinese photinia, J. B. STEINWEDEN (*Calif. Dept. Agr. Bul.*, 29 (1940), No. 3, p. 151).—Considerable injury to young, tender foliage of Chinese photinia (*Photinia serrulata nova*) observed in nurseries in Stanislaus, Merced, and Fresno Counties, Calif., by the citrus thrips is reported. Its attack on young foliage of Virginia creeper (*Ampelopsis quinquefolia*) near Fresno is recorded.

The longevity of the fasting bed-bug (*Cimex lectularius* L.) under experimental conditions and particularly in relation to the saturation deficiency law of water-loss, C. G. JOHNSON (*Parasitology*, 32 (1940), No. 3, pp. 239-270, figs. 11).

The biology of *Anasa tristis* DeGeer, with particular reference to the tachinid parasite *Trichopoda pennipes* Fabr., R. L. BEARD (*Connecticut [New Haven] Sta. Bul.* 440 (1940), pp. 593-679, pls. 3, figs. 18).—The synonymy, morphology, and life history of the squash bug are discussed. High temperatures favor oviposition, the peak of which is reached in early July. Nymph mortality and winter mortality of hibernating adults are high. *T. pennipes* (Diptera: Tachinidae) is the most important natural enemy of the squash bug; its synonymy, morphology, and life history are discussed. This parasite deposits eggs on the surface of the host, principally on the abdomen. Larvae upon hatching bore through the body wall to spend their larval life attached to a tracheal branch from the metathoracic spiracle within the body cavity of the host. Mature larvae emerge through the posterior end of the bug and pupate in the soil. The host usually dies within 24 hr. after the emergence of the parasite. Superparasitism occurs commonly, but the supernumerary maggots are destroyed, leaving only one to mature in each host. The author suggests that cannibalism is probably responsible for this elimination. When older squash bug nymphs become parasitized the maggot remains in the first instar until the host matures. Death to the host is the result of larval emergence. Parasitic castration causes a reduction of oviposition by the female. The life histories of the squash bug (one generation) and the parasite (three generations) do not synchronize sufficiently for the parasite to maintain the squash bug at a low population density.

Plant bugs in citrus groves. (Fla. Expt. Sta.). (*Citrus Indus.* [21] (1940). [No. 10], pp. 16, 17, 18, 19).—Two contributions are presented, one by W. L. Thompson (pp. 16, 17) and the other by J. R. Watson (pp. 18, 19).

Three species of the genus *Lygus* and their relation to alfalfa seed production in southern Arizona and California, L. L. STITT (*U. S. Dept. Agr., Tech. Bul.* 741 (1940), pp. 19, figs. 2).—*L. hesperus* Knight, *L. elisus* Van Duzee, and *L. pratensis oblineatus* (Say) and their relation to alfalfa seed production in southern Arizona and California are discussed. Observations on seasonal activities, food plants, character of injury, economic importance, life history, natural enemies, and control are included. Both cage and field studies demonstrated that *Lygus* bugs seriously damage alfalfa flower parts and immature seed, and positive relationships between *Lygus* populations and percentage of flower fall were noted. Important host plants included alfalfa, cotton, sugar beets, winter mustard, and sowbane. Two species of spiders, several Hemiptera (*Geocoris* spp. and *Nabis ferus* (L.)), and the ant *Formica perpilosa* were observed attacking *Lygus* bugs. It was noted that *Lygus* populations varied with the stage of growth of the alfalfa and that lack of uniformity in alfalfa cutting in a locality resulted in heavy infestations while uniform cutting of all fields reduced the infestation and resulting damage.

Delphax striatella Fallen as vector of the virus disease zakuklivanie in grains, K. S. SUKHOV and P. T. PETLYUK (*Compt. Rend. (Dok.) Acad. Sci. U. R. S. S., n. ser.*, 26 (1940), No. 5, pp. 483-486).—The results of a study of the biology of *D. striatella*, vector of the virus of the zakuklivanie disease of grains, particularly in the vicinity of Omsk, are reported.

Species and variety differences in resistance to aphid injury in vetch, H. R. ALBRECHT. (Ala. Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 833, 834).—The evaluation of vetch species and varieties within a species grown at Auburn, Ala., revealed a considerable difference in the reaction of their foliage to injury resulting from attack by the pea aphid. Field observations and tests with caged plants showed that the inflorescences and green pods of both the resistant and susceptible vetches could be severely damaged by

aphids. It is thought probable that this injury limited the seed production of the vetches studied.

"Snowball" bushes are sometimes deformed by aphids, F. L. GAMBRELL (*Farm Res. [New York State Sta.]*, 7 (1941), No. 1, p. 15, fig. 1).—A practical account, including data on methods of control.

Females of the San Jose scale rendered unproductive by lime-sulfur, M. A. YOTHERS. (U. S. D. A.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 890-892).—The experiments reported indicate that the unproductivity of female San Jose scales sprayed with lime-sulfur may be due to the action of the spray on the generative organs or to lack of fertilization on account of death of the males by the spray.

Fumigation of walnut trees in Ventura County, D. L. LINDGREN and R. C. DICKSON. (Calif. Citrus Expt. Sta.). (*Calif. Dept. Agr. Bul.*, 29 (1940), No. 3, pp. 146-151, figs. 3).—The fumigation of walnut trees in Ventura County, Calif., for the control of the California red scale is reported upon.

The citrus red scale problem in New South Wales, with special reference to fumigation, P. C. HELY (*Jour. Austral. Inst. Agr. Sci.*, 6 (1940), No. 3, pp. 140-146).—Hydrocyanic acid gas is considered to be the most satisfactory fumigant available at the present time for the California red scale, since if properly applied it can quite generally be relied upon to give a highly satisfactory kill of the scale.

Hydrocyanic acid dosages in relation to control by fumigation of [California] red scale (*Aonidiella aurantii* (Mask.)) on citrus, A. F. SWAIN and R. P. BUCKNER (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 895-900, figs. 8).

Asterolecanium variolosum Ratzeburg, a gall-forming coccid, and its effect upon the host trees, T. PARR (*Yale Univ. School Forestry Bul.* 46 (1940), pp. [5]+49, pls. 15).—A study of the taxonomic position, anatomy, biology, and economic importance of the golden oak scale *A. variolosum*, including its effect upon the trees and upon the host tissues, salivary gland enzymes, and the chemical changes in the plant tissue, is reported upon. This scale, recognized as a pest of oak in Europe, has spread throughout the entire world wherever its hosts occur, several species of the white oak group being attacked. Eighty-three references to the literature cited are listed.

On coccids found on roots of plants in Egypt, M. HOSNY (*Egypt Min. Agr., Tech. and Sci. Serv. Bul.* 237 (1939), pp. [3]+21, pls. 3).

Effects of defoliation by the pine butterfly upon ponderosa pine, J. C. EYENDEN. (U. S. D. A.). (*Jour. Forestry*, 38 (1940), No. 12, pp. 949-955, figs. 5).—Report is made of a severe defoliation of ponderosa pine by the pine butterfly over thousands of acres in the Payette Lakes area of central Idaho in 1922 and its effect upon the defoliated mature pine. By 1935, 13 yr. later, 26 percent of the trees had died, and the growth of those that survived was adversely affected by the defoliation. The severity of the defoliation is believed to be the most important factor contributing to the ultimate death or survival of the defoliated trees.

Investigations on the biology and control of the alfalfa caterpillar (*Colias eurytheme* Boisduval), E. H. FLOYD (*La. State Univ. Bul.*, n. ser., 32 (1940), No. 1, pp. 86, 87).—An abstract of a thesis.

Studies on the biology and control of sod webworms in California, R. M. BOHART. (Univ. Calif.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 886-890, fig. 1).—The larvae of the two webworms known to damage lawns in California, namely, *Orambus donifatellus* (Hulst) and *O. sperryellus* Klots, are said to be the most serious annually recurring pests of bluegrass and bentgrass lawns in that State. The first mentioned occurs especially along the coast and the

latter predominates in the drier inland valleys. These species were found to complete their life cycle in 6 weeks or less in warm weather, and four generations are normally completed in a year. "Temporary control was obtained by the use of sprays containing pyrethrum extract, derris extract, and dichloroethyl ether, but none of these treatments prevented reinfestation in 3 weeks to a month's time. Therefore, it was necessary to repeat the treatment from one to three times during the summer. Lead arsenate used at the rate of 5 lb. to 1,000 sq. ft. in 50 gal. of water with 2 lb. of white flour added as an adhesive gave excellent temporary control and retained its effectiveness throughout the season under most conditions. Where watering is done every day it may be necessary in some cases to make two applications a month apart, using 10 lb. of lead arsenate and 4 lb. of flour to 1,000 sq. ft."

Melissopus latiferreanus as a pest of filberts in the Northwest, S. M. DOBANYI. (U. S. D. A.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 852-856).—Studies of the so-called filbert worm *M. latiferreanus*, which has caused the filbert growers of the Pacific Northwest great concern on account of its direct damage to the nuts and the expense involved in sorting the infested nuts from sound ones, are reported. It is widely distributed and has a diverse number of host plants, although the most damage is caused by the larvae feeding in the kernel of the filbert nuts. Eggs hatch from 8 to 11 days after deposition, and in about 3 weeks the larvae are fully fed and ready for hibernation. They overwinter in cocoons until from 2 to 5 weeks before emergence as adults, at which time they go into the pupal stage. In Washington and Oregon the insect has one full generation a year and a partial second. Natural control agencies discovered during 2 yr. of study include more than six hymenopterous parasites of the larvae and one dipterous pupal parasite.

A progress report on the use of rotenone dusts for the control of the pickleworm and the melonworm in Alabama, F. S. ARANT. (Ala. Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 840-848, figs. 3).—In experiments with the pickleworm and the melonworm at Auburn, derris-talc dusts containing 1 percent rotenone were effective in controlling both insects on small field plats. The control in cantaloups varied from 83 to 100 percent and in squash from 89 to 100 percent. "A derris dust containing 25 percent sulfur was effective against the insects but caused such severe burning to cantaloup foliage that an average of only 2.2 ripe edible fruits per 10 hills was produced, as compared with 3.1 on the checks and approximately 31 edible melons per 10 hills on plants dusted with derris and talc. Derris mixtures containing 0.5 percent rotenone were less effective than dusts containing 1 percent rotenone. Cube appeared to be inferior to timbo and derris. Heavy applications of dusts were made, approximately 15 to 30 lb. per acre, and no attempt was made to determine the minimum effective rate of application."

Experiments to control the grape-berry moth (*Polychrosis viteana* Clemens), Erie County, 1939.—Progress report, H. N. WORTHLEY and B. D. GLEISSNER (*Pennsylvania Sta., Jour. Ser. Paper* 959 (1940), pp. [8]).

Will a dormant spray protect the apple crop against bud moth? F. Z. HARTZELL (*Farm Res. [New York State Sta.]*, 7 (1941), No. 1, pp. 1, 14).—The importance of dormant and summer sprays for control of the bud moth is emphasized.

Codling moth problem intensified (Arkansas Sta. Bul. 405 (1940), pp. 41, 42).—A report on migration studies and some other factors influencing percentage of codling moth infestation.

Attractiveness to codling moth of substances related to those elaborated by heterofermentative bacteria in baits, J. R. EYER and J. T. MEDLER. (N. Mex. Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 933-940).—In this contribution (E. S. R., 78, p. 265) the results of additional comprehensive field tests during 1937 and 1938 are reported. Cane sirup bait consisting of Brer Rabbit sirup 1 part to 9 parts of water fermented by species of *Aerobacter* and *Aerobacillus* was found to be more attractive to the codling moth in the State than the same bait allowed to ferment through contamination by the yeast, mold, and bacterial flora of the air. Analyses of this bait revealed that ethyl alcohol, acetic and lactic acids, and acetylmethylcarbinol are the most prevalent of the compounds in these respective classes during the first 10 days of fermentation. A review of the literature relating to the chemical products elaborated by these bacteria in the fermentation of sucrose, glucose, and fructose suggested that homologous series of alcohols, acids, and esters related to the above-mentioned be exhaustively compared in a number of different ways. A design of an olfactometer somewhat similar to that used by earlier investigators in determining the response of the codling moth to colored lights proved useful in making preliminary comparison of these organic chemicals in the laboratory. Also a mixture of tragacanth, glycerine, and water was found instrumental as a medium for the emulsification of these chemicals for comparison.

"In tests in the olfactometer more of the hydroxy, dibasic, and aromatic acids proved attractive than the aliphatic acids and simple alcohols. Of the simple alcohols and acids, the three carbon groups (propyl or propionyl) proved consistently attractive. Of the esters of the same, the methyl series exhibited the most consistent degree of attractiveness when the alcohol radicle is considered, and the propionyl series when the acid radicle is considered. Of the hydroxy and dibasic acid esters, those of malonic, malic, lactic, and oxalic were attractive. Of the more complex alcohols and esters, those possessing a phenyl radicle were consistently attractive both in olfactometer and field comparisons. Since a wide variety of alcohols, acids, esters, and gases related to those elaborated by heterofermentative bacteria in the fermentation of sirup bait were found to be attractive, it is concluded that no one chemical is to be considered the most important or key factor in the chemotropic response of the codling moth."

Calcium arsenate and lead arsenate sprays with soybean flour for codling moth control, L. T. GRAHAM and C. H. RICHARDSON. (Iowa Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 862-865, fig. 1).—It was found in work in Iowa during the season of 1939 that ordinary commercial calcium arsenate sprays with ferrous sulfate "safener" control the first-brood codling moth about as well as lead arsenate sprays and cause no injury to apple foliage. For heavy first-brood infestations and for moderate or heavy second-brood infestations lead arsenate was more reliable than the calcium arsenate-ferrous sulfate mixture. The addition of soybean flour to calcium arsenate or to lead arsenate sprays in the proportion of 12 oz. to 100 gal. of spray neither increases nor lessens the efficiency of the arsenical for codling moth control.

The present status of organic insecticides for codling moth control, R. L. WEBSTER, J. MARSHALL, and H. FALLSCHEER. (Wash. Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 909-912).

The cotton leaf worm in the Western Hemisphere, L. PYENSON (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 830-833, fig. 1).

Seasonal abundance of eggs of the corn ear worm moth in Virginia, W. J. PHILLIPS and G. W. BARBER. (U. S. D. A.). (*Jour. N. Y. Ent. Soc.*, 48 (1940), No. 4, pp. 305-317, figs. 2).—The daily examination of selected corn plants of

successive plantings in two localities and four environments during a period of 6 yr. gave data on 16 seasonal records of egg occurrence, which are reported in tables and charts. A considerable difference in the seasonal occurrence of eggs was found to be dependent in part on earliness or lateness of the spring or fall. Precipitation seemed to be a principal factor in determining the abundance of the eggs.

Notes on the biology of the corn ear worm (*Heliothis obsoleta* Fabricius), E. R. LEFT, JR. (*La. State Univ. Bul.*, n. ser., 32 (1940), No. 1, p. 209).—An abstract of a thesis.

Tentative method of test for resistance of textile fabrics and yarns to moths (In *A. S. T. M. Standards*, 1940 Sup., III. Philadelphia: Amer. Soc. Testing Mater., [1940], pt. 3, pp. 422, 423).—A description is given of a method of test which covers the procedure for determining the resistance to clothes moths and carpet beetles of treated textile fabrics or yarns containing wool or other hair fibers.

Some factors influencing feeding activity of simuliids in the field, G. W. UNDERHILL (Va. Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 915-917, figs. 5).—In a study of the feeding activity of blackflies on turkeys, there was found to be a "definite relationship between the feeding of the insects and temperature, maximum feeding taking place at temperatures of 75° to 85° F. The flies were observed feeding at humidities as low as 42 percent and as high as 89 percent. Apparently humidity was not an important factor in the feeding activity of the insect. The flies were mostly active in feeding at a low atmospheric pressure or following a rapid fall in the barometer. Maximum feeding took place at barometric pressures of 27.85 and 28.05 in. (at 2,000 ft. elevation). Strong wind prevented feeding of the flies. They fed most actively when there was a calm or, at most, only a light breeze."

Introduction of dry area race of *Metagonistylum minense* into Barbados, R. W. E. TUCKER (*Agr. Jour. [Barbados]*, 8 (1939), No. 4, pp. 113-127).—A report on the work attending the introduction of the melanic dry area variety of the Amazon fly *M. minense* from São Paulo, Brazil, in April and May 1939 into Barbados by airplane, its breeding in the laboratory and liberation in the sugarcane field.

The feather-legged fly, H. E. BRATLEY. (Fla. Expt. Sta.). (*Citrus Indus.*, [21] (1940), [No. 10], pp. 6, 11).—The importance of the dipterous parasite known as the feather-legged fly as an enemy of the southern green plant bug is noted.

The nutritional requirements of screwworm larvae, R. MELVIN and R. C. BUSHLAND. (U. S. D. A.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 850-852).—In rearing larvae for experimental purposes an artificial medium consisting of 1 l. of water, 6 cc. of formalin (89 percent formaldehyde), 1 kg. of finely ground lean beef, and 500 cc. of citrated beef blood (3 gm. of sodium citrate per liter of blood) has been successfully used. Variations of this formula are possible, but the proportion of formalin should not be changed.

Lateral migration and depth of pupation of the larvae of the primary screwworm *Cochliomyia americana* C. and P., B. V. TRAVIS, E. F. KNIPLING, and A. L. BBODY. (U. S. D. A.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 847-850).—The investigations reported indicate that 90 percent of the larvae pupate within a radius of 18 in. from where they drop, and that under field conditions practically all larvae pupate in the soil within ½ in. of the surface.

The insecticidal effects of organic compounds.—I. Toxicity of sulfur and nitrogen compounds to fleshfly larvae, W. M. HOSKINS, H. P. BLOXHAM, and M. W. VAN ESS. (Univ. Calif.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 875-881).—In the studies reported, the details of which are given in tables, the

toxicity to larvae of the flesh fly *Lucilia sericata* of representatives from several series of organic compounds containing amino nitrogen or sulfur, or both, was determined through the addition of the substances at various concentrations to a synthetic diet. "Di- and tri-aliphatic amines are more toxic than the monoamines, but the reverse relation holds with the aromatic amines. Mercaptans and monosulfides are relatively nontoxic. Disulfides are more toxic than monosulfides. The group $-C(=S)N=$ gives rise to highly toxic compounds, especially thiourea, certain of its derivatives, and certain thioamides. Introduction of a phenyl group upon the nitrogen reduces toxicity. Substitution upon the sulfur atom reduces the toxic effect. Since thiourea has little toxicity to leaf-eating insects, but is very effective against flesh fly larvae and clothes moth larvae, it may be that the mechanism of its poisonous action is to be sought in the behavior of the enzymes concerned in the metabolism of a highly proteinaceous diet."

Experimental studies on the influence of low temperatures upon the development of fruit-flies.—XI, Are the eggs, larvae, and pupae of Formosan fruit-flies possible to develop in the temperatures of the autumn, winter, and spring of the main-land of Japan? XII, On the acclimation to low temperatures in the pupae of *Chaetodacus ferrugineus dorsalis* Hendel, K. KOMSURI (*Jour. Soc. Trop. Agr. (Nettai Nôgaku Kwaishi)*, 11 (1939), No. 2, pp. 130-151; 12 (1940), No. 1, pp. 48-53).—A continuation of the series (E. S. R., 81, p. 549).

New elm pest invades Utah, G. F. KNOWLTON (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 4, p. 2, fig. 1).—A practical discussion of the biology and control of the elm leaf beetle, which is well established as an elm pest at Smithfield.

Parasites of the elm leaf beetle, S. E. FLANDERS. (Calif. Citrus Expt. Sta.). (*Trees Mag.*, 3 (1940), No. 2, p. 14).

Notes on the species of white grubs present in the Saratoga Forest Tree Nursery, C. E. HEIT and H. K. HENRY (*Jour. Forestry*, 38 (1940), No. 12, pp. 944-948, figs. 3).—Observations of white grubs at the New York State Saratoga Forest Tree Nursery have shown six species, namely, *Polyphylla variolosa*, *Phyllophaga tristis*, *P. fusca*, *P. ansia*, *Diploptosis sordida*, and *Pachystethus lucicola*, to have caused severe injury to the roots of coniferous trees during 1 yr. of the 6-yr. period under study and five species to be of questionable importance. Description is given of the easily recognized characteristics which seem to differentiate the various beetle larvae. It is pointed out that certain species which have received little or no attention in this field may be even more serious in their effect than those of the well-known genus *Phyllophaga*.

A promising fungous pathogen of adult Japanese beetles (*Popillia japonica*), E. G. REX (*Journal N. Y. Ent. Soc.*, 48 (1940), No. 4, pp. 401-403).—It has been found that the spores of *Beauveria bassiana* may be produced cheaply and in large quantities upon a variety of culture media. Preliminary tests of infection in adult beetles indicate that this fungus may be a promising new natural control agency for the Japanese beetle.

The bronze birch borer and its relation to the dying of birch in New Brunswick forests, R. E. BALCH and J. S. PREBBLE (*Forestry Chron.*, 16 (1940), No. 3, pp. 179-201, figs. 9).—This account of the bronzed birch borer, native to North America, which during the past 5 yr. has caused the death of large numbers of yellow, white, and gray birch in New Brunswick, is presented with a list of 27 references to the literature. In 1939 the typical mature yellow birch stand showed about 20 percent of the trees dead and 35 percent with over half the crown dead.

Life history and control of the imported willow leaf beetle, C. E. HOON (*U. S. Dept. Agr. Cir.* 572 (1940), pp. 10, figs. 3).—During the past few years

Plagioder a versicolora (Laich.), the imported willow leaf beetle, has become prevalent in many sections of New England. It is a small, robust beetle, metallic blue in color and sometimes tinged with red or bronze. In eastern New England the adult, which hibernates under willow bark or in grass, debris, etc., appears the latter part of April or early in May, feeds briefly, and begins oviposition. Black willow and golden willow are the preferred food plants, but the insect also feeds on Babylon weeping willow and the shiny willow. It has three full generations and a partial fourth annually. Extremely cold winters are fatal to adults not well protected, and the parasite *Schisonotus sieboldi* (Ratz.) often kills pupae. If care is exercised in treating the under surface of the foliage, efficient control results from the application between May 25 and June 25 of 4 lb. of lead arsenate per 100 gal. of water plus fish oil or linseed oil to act as an adhesive.

Tests with benzene, paradichlorobenzene, and other insecticides against the tobacco flea beetle (*Epitrix parvula* (F.)) in plant beds, N. ALLEN and W. A. SHANDS. (U. S. D. A., S. C. Expt. Sta., et al.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 834-840, figs. 3).—The use of benzene and paradichlorobenzene as control measures for downy mildew in tobacco plant beds led the authors to investigate their toxicity to the tobacco flea beetle in the plant beds being treated experimentally for blue mold. Concentrations of benzene vapor considered adequate for effective control of blue mold were not toxic to the tobacco flea beetle. In experiments with paradichlorobenzene, applied daily at rates of 0.25, 0.5, 1, and 2 oz. per square yard of plant bed, it was not toxic and apparently had little if any repellency to the flea beetle where ordinary plant-bed cover was used. Where covers having from 38 by 38 to 64 by 64 threads per square inch were used, probably resulting in greater concentrations of the vapor, a few beetles were killed, some were made sluggish but continued to feed to some extent on the plants, and the material had some repellent action, but at rates and by methods known to control blue mold it cannot be considered a satisfactory control for flea beetles in plant beds.

A maize and strawberry pest, *Clivina rugithorax* Putz., J. MUGGERIDGE (*New Zeal. Jour. Sci. and Technol.*, 21 (1939), No. 3A, pp. 184A-186A, figs. 2).—The native carabid *C. rugithorax* here considered caused considerable injury to recently planted corn by eating into the kernel of the seed, and was also found attacking ripe strawberries.

Effect of ether on the toxicity of certain fumigants to the confused flour beetle (*Tribolium confusum* Duval), H. GUNDERSON. (Iowa Expt. Sta.). (*Iowa State Col. Jour. Sci.*, 14 (1940), No. 4, pp. 405-417, figs. 7).—Under experimental conditions carbon disulfide, carbon tetrachloride, and ethyl acetate were more than seven times as toxic to the confused flour beetle as was ether.

The scolytid beetles of the genus *Renocis* Casey, with descriptions of nine new species, M. W. BLACKMAN (*U. S. Natl. Mus. Proc.*, 88 (1940), No. 3084, pp. 373-401, figs. 2).

Fumigation of sweetpotatoes with methyl bromide for control of the sweetpotato weevil, S. S. EASTER. (U. S. D. A. et al.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 921-926).—In the fumigation work reported upon a complete kill of all stages of embedded sweetpotato weevils was obtained at both reduced and atmospheric pressures. The gas exerts a variable deleterious physiological effect on the sweetpotatoes which may result in a considerable loss. This loss may be avoided partially by careful handling, partial curing, and postfumigation heating. Small-scale fumigations run on seed sweetpotatoes from a number of farms gave results satisfactory to the farmers. The loss was not prohibitive, and the production of plants was equal to or better than

that in the checks. The requirement of an airtight fumigation chamber and provision for postfumigation heating may restrict the use of this fumigant to those areas where the sweetpotatoes are raised on a commercial scale.

Experiments with derris and cubé dusts for pea weevil control, T. A. BRINDLEY, F. G. HINMAN, and R. A. FISHER. (U. S. D. A.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 881-886, figs. 3).—The results of laboratory and field work with derris and cube dusts, which have been effective in the control of the pea weevil in the Northwest, are reported. It was found that this enemy of the pea can be controlled in both green and dry peas by the application of derris dust mixtures with a rotenone content ranging from 0.5 to 1 percent. "Large-scale field tests demonstrated that the application of dust mixtures containing either 0.75 or 1 percent of rotenone derived from derris, cube, or timbo, at rates ranging from 25 to 40 lb. per acre, gave satisfactory control. No significant difference could be detected between the performance of the two dilutions of the mixture. It was found that the use of a hood or of a short trailing canvas on the dusting machine increased the efficiency of the treatment by preventing excessive wind drift. When the pea weevils continued to migrate from hibernation quarters to pea fields after the first dust application two and sometimes three dustings were necessary. Satisfactory control of the pea weevil was achieved only when all infested parts of pea fields were treated."

The lesser pepper weevil *Lophobaris piperis* Marsh. [trans. title], J. VAN DER VECHT (*Landbouwk [Buitenzorg]*, 16 (1940), No. 6, pp. 323-366, figs. 7; *Eng. abs.*, pp. 364-366).—An account of the biology, importance, and control of *L. piperis* as it occurs in Java, Sumatra, and Borneo. Observations of four natural enemies, including three chalcidoids and a braconid, are presented.

Further notes on *Bathyplectes curculionis* and the alfalfa weevil in lowland middle California, A. E. MICHELbacher. (Univ. Calif.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 892-895, fig. 1).—Report is made of further observations of the larval parasite *B. curculionis* of the alfalfa weevil (E. S. R., 83, p. 664). This parasite has been most effective in the cooler coastal regions, where it has played an important part in reducing the alfalfa weevil populations.

The distribution of California buckeye in the Sierra Nevada in relation to honey production, G. H. VANSELL, W. G. WATKINS, and L. F. HOSBROOK. (Coop. U. S. D. A.). (*California Sta.*, 1940, pp. 4, pls. 18).—California buckeye (*Aesculus californica*) has been an important factor in the failure of many attempts by deciduous fruit growers to keep bees in foothill orchards in California. When a high percentage of buckeye products is received in the food of the bees, a condition soon arises in which only eggs, day-old larvae, and sealed brood are present, the absence of unsealed brood being a typical symptom of "buckeyed" colonies. Later eggs alone are found in the cells. The distributional maps included in this publication show the upward limit of buckeye in the Sierra Nevada from the point where it crosses the Sacramento River in Shasta County southward into Tulare County, except for small sections in Nevada and Placer Counties between Grass Valley and the Rubicon River, which because of limited funds could not be surveyed.

Relative humidity and nectar concentration in fireweed, H. A. SCULLEN. (Oreg. Expt. Sta.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 870, 871, fig. 1).—Studies conducted throughout Oregon have shown a decided preference of bees for the more concentrated nectars when working in the field. The data presented in table and chart form clearly show that the relation of relative

humidity to nectar concentration in fireweed is "highly significant in a negative manner."

Trapping honeybee-gathered pollen and factors affecting yields, F. E. TODD and R. K. BISHOP. (U. S. D. A., Univ. Calif., et al.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 866-870, fig. 1).—In a study made of the seasonal distribution of pollen brought into the hive by honeybees use was made of pollen traps prepared by placing two parallel strips of hardware cloth over the hive entrance in such a way as to permit the ready passage of field bees but to relieve them of their pollen loads. The full year's trappings ranged from about 13.5 to 18 kg. per colony for the various areas. Pollen yields were found to be influenced by weather factors and by colony strength. Seasonal trends were in rhythm with the flowering of good sources. Peaks in the cycles occurred not during population peaks but during the blooming of good sources, while lows occurred during dearth of blossoms.

The toxicity of tartar emetic to the honeybee, J. E. ECKERT. (Univ. Calif.). (*Jour. Econ. Ent.*, 33 (1940), No. 6, pp. 872-875, fig. 1).—In work conducted in California it was found that, while the minimum lethal dose of tartar emetic for the honeybee is between 3 and 6 μ g per individual, the tartar emetic-sugar spray applied in greater concentrations in the control of the citrus thrips did not cause noticeable loss during the year to colonies in the vicinity of treated fields.

The Argentine ant in Victoria: A report on survey and control measures adopted following its discovery in Melbourne, T. W. HOGAN (*Jour. Dept. Agr. Victoria*, 38 (1940), No. 10, pp. 486-493, figs. 9).—Report is made of a survey of the metropolitan area of Melbourne following the appearance of the Argentine ant in Australia, as reported in September 1939, and a description given of the methods used. A system of suburban inspections resulted in the discovery of 13 minor areas of infestation.

Notes on the life history of some beneficial Javanese Campsomeris species [trans. title], C. J. H. FRANSSEN (*Landbouw [Buitenzorg]*, 16 (1940), No. 5, pp. 292-315, figs. 22; *Eng. abs.*, pp. 312, 313).—Studies of the dagger wasps of the genus *Campsomeris*, well known natural enemies of white grubs in Java, including the technic employed in rearing the wasps in the laboratory, are reported.

Revision of the chalcid-flies of the tribe Chalcidini in America north of Mexico, B. D. BURKS (*U. S. Natl. Mus. Proc.*, 88 (1940), No. 3082, pp. 237-354, figs. 9).—This revision of the tribe Chalcidini includes descriptions of 14 species new to science. It is pointed out that the species of the genus *Chalcis* are larval parasites and that all the other species that have been reared are pupal parasites. A host catalog is included.

Larval disease prevalent in heavy infestations of the European spruce sawfly in southern New Hampshire and Vermont, P. B. DOWDEN. (U. S. D. A.). (*Jour. Forestry*, 38 (1940), No. 12, pp. 970-972, fig. 1).—During 1939 a disease, the causative organism of which has not been identified, destroyed tremendous numbers of larvae of the European spruce sawfly in heavily infested areas in southern New Hampshire and Vermont. The disease, which affects the first five larval stadiums, is similar in effect to the wilt diseases of other insect larvae.

Establishment in the United States of Microplectron fuscipennis Zett., a parasite of the European spruce sawfly, P. B. DOWDEN, W. F. SELLERS, and F. E. MILLER, JR. (U. S. D. A.). (*Jour. Forestry*, 38 (1940), No. 12, pp. 972-974).

Review and summary of studies of insects associated with *Lemna minor*, M. B. SCOTLAND. (Cornell Univ.). (*Jour. N. Y. Ent. Soc.*, 48 (1940), No. 4, pp. 319-333, figs. 21).

Eriophyid studies, IX, X, H. H. KEIFER (*Calif. Dept. Agr. Bul.*, 29 (1940), Nos. 2, pp. 112-117, figs. 4; 3, pp. 160-179, figs. 16).—In continuation of this series of studies (E. S. R., 83, p. 528), 4 new species are described in part 9. In part 10, 4 genera are erected and 16 species described as new. One of these, *Phyllocoptes destructor* Keifer n. sp., is of particular importance because of its serious damage on two occasions to tomatoes in California. *Calacurus adornatus* K. is listed as a camelia pest of some importance.

Rotenone in low concentration as a tickicide and insecticide for house pets, Z. DE JESUS and R. B. GAPUZ (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 4, pp. 391-395).—A mixture of rotenone and cassava starch as a vehicle in concentrations of 1 and 2 percent rotenone has been found to be an economical, very convenient, nontoxic, and effective tickicide and insecticide for use on dogs and cats. The brown dog tick and a species of *Dermacentor* were killed in from 24 to 72 hr., these ticks having remained attached to the skin of the host, where they died and dried up.

The biology and economic importance of a nematode parasitic in insects, R. W. GLASER, E. E. MCCOY, and H. B. GARTH. (U. S. D. A. et al.). (*Jour. Parasitol.*, 26 (1940), No. 6, pp. 479-495, figs. 8).—In work with the nematode parasite of the Japanese beetle, *Neoaplectana glaseri* Steiner, its life history on culture media was found to be similar to that in nature (E. S. R., 74, p. 238).

ANIMAL PRODUCTION

[Animal husbandry studies by the Arkansas Station] (*Arkansas Sta. Bul.* 405 (1940), pp. 17-22).—These studies dealt with feeding trials with cottonseed meal v. soybean meal as a supplement to corn and pasture for fattening pigs, carried on by S. R. Johnson; cross-breeding for broiler production, by W. R. Horlacher, R. M. Smith, and W. H. Wiley; and the use of mash developed by the station for starting and growing broilers, by Johnson and Smith.

[Livestock production investigations by the Colorado Station] (*Colorado Sta. Rpt.* 1940, pp. 15, 16, 17, 40-42).—The results are briefly reported of the following investigations in progress: Yellow and white corn, barley, wheat, and milo when fed to lambs with alfalfa, cane fodder, and beet tops; comparison of cut milo and corn fodder for fattening lambs; depletion of birds for assay of riboflavin; the utilization by poultry of minerals from various sources; the riboflavin requirements of turkeys for breeding; and the iodine requirements of poultry.

[Experiments with livestock by the Montana Station], R. T. CLARK, D. HANSEN, A. E. SEAMANS, R. M. WILLIAMS, F. S. WILLSON, and J. R. QUESENBERG. (Partly coop. U. S. D. A.). (*Montana Sta. [Bien.] Rpt.* 1939-40, pp. 16, 17-19, 50, 52, 53, 55-57, 59-62).—Included are brief reports of progress on the following investigations: Survey of marketing and feeding costs in lamb production; management and utilization of forage by sheep on summer range; lamb feeding on rations consisting of 50 percent molasses beet pulp and 50 percent oats in comparison with rations of one-third of each of these substances and one-third of alfalfa hay; fattening calves on barley and molasses beet pulp; the superiority for market lamb production of Suffolk as compared with Hampshire, Columbia, Romney, and Corriedale lambs for mating with grade Rambouillet ewes; the use of cottonseed-molasses beet pulp pellets as a supplement to crested wheat-

grass range and hay for wintering beef cattle; lamb feeding experiments with home-grown feeds; comparison of forage crops for swine; beef production on crested wheatgrass, brome grass, and native range; seasonal changes in the high value of crested wheatgrass for beef production; and the effect of plane of nutrition of beef cows on the calf crop. From cooperative investigations with the U. S. Range Livestock Experiment Station at Miles City results are presented on the quality of meat produced by calves and record-of-performance studies of beef sires; rate of grazing cattle and sheep and its influence on the progeny; and the development of superior strains of swine.

Some recent observations on the feeding values of some local animal foodstuffs, M. H. FRENCH (*East African Agr. Jour.*, 6 (1940), No. 2, pp. 87-90).—Observations were reported on the feeding of canna tops and tubers, velvetbeans, wheat bran, kapok seed cake, leaves of *Ficus sycamorus*, and banana plants to livestock, especially cattle.

The nutritional basis of the artificial drying of home-grown fodders [trans. title], H. EDIN (*K. Lantbr. Akad. Tidskr.*, 79 (1940), No. 3, pp. 211-230, fig. 1; *Eng. abs.*, pp. 227-230).—Different methods of drying were compared for conserving the net energy and digestible protein in grasses and legumes cut at different seasons of the year. In hay cured on wire racks, about 75 percent of the feed units and digestible protein was conserved. In silage there was from 65 to 80 percent saved. On the other hand, it was possible to conserve from 97 to 100 percent of the feed units and from 92 to 100 percent of the protein by artificial drying. The loss of protein was greatest in rapid driers in which a temperature above 500° C. was attained.

A silage investigation with marrow stem kale [trans. title], A. HELLBERG (*K. Lantbr. Akad. Tidskr.*, 79 (1940), No. 3, pp. 261-269, fig. 1; *Eng. abs.*, p. 269).—A comparison of the quality of silage of marrow stem kale cut in 1, 2.5, 5, and 10 cm. lengths showed little benefit from the finer cutting. The quality of all silage was good, and the pH, ammonia, and organic acids varied little except that there was no butyric acid in the finest-cut lot. There was less loss in dry matter in the finer-cut group.

The effect of replacing solvent-extracted soybean oil meal with soybeans in a low fat ration, A. R. SCHUBERT and J. G. WELLS (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, pp. 72, 73).—The basal concentrate ration used in this experiment consisted of ground barley and solvent-extracted soybean meal and contained 1.3 percent ether extract. Alfalfa hay and grass silage constituted the roughage ration. The high fat concentrate ration consisted of ground barley and ground soybeans and contained 4.75 percent ether extract. Changing one group of cows from the basal to the high fat ration for 30 days failed to influence significantly the production of milk or butterfat as compared with the check group continued on the basal ration.

Inspection of commercial feeding stuffs, 1940, T. O. SMITH and H. A. DAVIS (*New Hampshire Sta. Bul.* 327 (1940), pp. 106).—This is the usual report of the guaranteed and found analyses of 495 brands of feeding stuffs collected for official inspection during the year ended June 1940 (E. S. R., 82, p. 521).

Analyses of commercial feeding stuffs and registrations for 1940, C. S. CATHCART (*New Jersey Sta. Bul.* 680 (1940), pp. 64).—A summary of the results of the 1939 feed inspection and a tabulation of the guaranteed and found analyses of 1,517 samples of feeds are presented (E. S. R., 82, p. 372).

Commercial feeding stuffs from September 1, 1939, to August 31, 1940, F. D. FULLER and J. SULLIVAN (*Texas Sta. Bul.* 594 (1940), pp. 221).—Included in this annual report (E. S. R., 82, p. 662) are tabulations of the guarantees and analyses of 3,592 samples of feeding stuffs submitted to chemical

analysis and microscopic examination, the results of bio-assay of 28 fish-liver oils, carotene determinations of 30 feeds, hardness tests for 27 samples of cottonseed cake, and determinations of salt and calcium carbonate in 385 and 363 samples, respectively. The average composition, digestible protein, and productive energy of many feeding stuffs analyzed and the average protein content of cottonseed products from each oil mill in the State are tabulated separately. Information is included on the chemical standards for various byproducts and special-purpose feeds and definitions of and standards for commercial unmixed feeds.

[Feeding experiments in Utah] (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 4, pp. 10, 12).—A progress report on feeds for turkeys and a summary, by A. C. Esplin, M. A. Madsen, and R. W. Phillips, of research on feeding ewe lambs previously noted (*E. S. R.*, 84, p. 374).

Vitamin A.—II, Occurrence in hay and silage—deficiency symptoms—requirements of horse, B. W. FAIRBANKS. (*Univ. Ill.*). (*North Amer. Vet.*, 21 (1940), No. 5, pp. 281-283).—A general discussion (*E. S. R.*, 84, p. 556).

Availability to white rats of phosphorus in *Lespedeza sericea* and alfalfa hays, D. E. WILLIAMS, F. L. MACLEOD, and E. MORRELL. (*Tenn. Expt. Sta. et al.*). (*Jour. Nutr.*, 19 (1940), No. 3, pp. 251-262).—The present experiments were designed to compare the availability to the rat of the P of low-P and of high-P hays. Triplicate feeding tests were conducted in which the experimental diets contained P at a minimum level of adequacy (0.16 percent) and all other nutrients at optimum levels, the same for all diets. The variable in these diets was the source of P, this element being furnished entirely by a salt mixture in the control diet, but in the test diets only half by the salt mixture, the balance (0.08 percent) being supplied by the hay. Leaves and stems of low-P *lespedeza* hay containing, respectively, 0.18 and 0.13 percent of P were compared with leaves and stems of high-P *lespedeza* hay containing, respectively, 0.26 and 0.27 percent of P. Low- and high-P alfalfa hays containing, respectively, 0.21 and 0.35 percent of P were also compared. Tests with the control diet where P was supplied by a readily assimilable salt mixture showed that a diet containing 0.16 percent of P and having a Ca:P ratio of 3:1 is just about minimal for normal growth and P retention when the diet is fed ad libitum or in slightly restricted amounts (as in the triplicate feeding tests).

As judged by growth of the animals and by P retention, the P of the low-P *L. sericea* or alfalfa hay was less available to the rat for growth and bone development than the P of the high-P hay of the same type. This difference in availability was apparently due to lack of absorption from the low-P hays, which were fed in relatively large amounts to supply the minimum amount of P. With these large amounts of hay there was increased elimination, as evidenced by increased fecal weight, with a loss of nutrients including P. Hays of higher P content were fed in smaller amounts and were apparently retained in the intestines long enough for sufficient digestion to make the P available to the rat.

Availability to white rats of phosphorus in soybean and red clover hays, D. E. WILLIAMS, F. L. MACLEOD, and E. MORRELL. (*Tenn. Expt. Sta. et al.*). (*Jour. Nutr.*, 20 (1940), No. 4, pp. 391-398).—Continuing the investigations noted above, soybean hay of low-phosphorus (0.12 percent) and high-phosphorus (0.21 percent) content and red clover hays containing 0.12 and 0.31 percent phosphorus were used as the principal ingredients in rat rations. The mineral supplement was varied to provide 0.16 percent phosphorus and an equal amount of calcium in each experimental diet. In each instance the retention of food phosphorus was materially higher from the high-phosphorus hay ration than from the low-phosphorus hay ration, while phosphorus elimination in the feces was much

higher on the low-phosphorus hay rations. With phosphorus at a minimal level, an increase in the calcium:phosphorus ratio resulted in a decrease in food consumption and in the amount of phosphorus stored in the animal body.

The identification of live stock by tattooing. C. E. ALLEN (*Sci. Agr.*, 21 (1940), No. 4, pp. 180-197, figs. 6).—Tattooing is suggested as a practical method of animal identification for swine, horses, sheep, cattle, and dogs. The procedure for carrying out the tattooing with the necessary dye is described.

The influence of climatological factors on cattle: Observations on cattle in tropical regions, J. C. BONSSMA (*Farming in So. Africa*, 15 (1940), No. 175, pp. 373-385, figs. 17).—Climatic conditions in South Africa are depicted in a series of maps. From experiments conducted at the Messina Experiment Station, where a mean temperature of about 70° prevails, data are graphically presented on the grazing habits, respiration counts, body temperature, saliva secretion, and pulse rate of Africander and purebred Hereford, Shorthorn, and Aberdeen Angus cattle. The superiority of the Africander over the exotic breeds in withstanding the effects of high temperature is strikingly demonstrated. It is concluded that the selection of breeding stock according to a European standard of excellence is not desirable in South Africa, and that a type must be evolved that will suit the ranching conditions of that country.

The length of time required for depletion of vitamin A reserves in range cattle, J. K. RIGGS. (Tex. Expt. Sta. and U. S. D. A.). (*Jour. Nutr.*, 20 (1940), No. 5, pp. 491-500).—The time required for 260 Hereford steers from 3 to 16 mo. of age and ranging from 225 to 550 lb. in weight to develop night blindness as the first symptom of vitamin A deficiency in eight lots on rations containing practically no carotene was ascertained. The younger animals had smaller reserves than older animals and therefore developed deficiencies in a shorter interval. The youngest group (from 3 to 6 mo. of age) required an average of but 56 ± 6 days for depletion as compared with 178 ± 37 days for depletion of the 16-month-old group. The amount of green vegetation as influenced by rainfall from season to season was an important factor in the amount of carotene present in the grass and the time required by the steers for depletion.

The birth weights of Red Scindi cattle at Alabang Stock Farm, M. MUÑOZ and T. V. RIGOR (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 3, pp. 263-267).—The mean birth weight of bull calves was 19.19 and of heifer calves 18.32 kg., averaging for bull calves 7.05 percent that of their dams and for heifer calves 6.38 percent. There was a significant positive correlation of the birth weight of bull calves and of the combined sexes to weight of dams, but a significant negative correlation between birth weight of heifers and weight of dams.

The influence of breeding on the performance of beef calves produced in Mississippi, A. E. COLLISON (*Mississippi Sta. Bul.* 347 (1940), pp. 14, figs. 6).—In continuation of this study (E. S. R., 82, p. 232), comparative tests are reported on the grades and gains of calves of native cows sired by native and by purebred bulls fed during the suckling and fattening periods in 1938-39 and 1939-40. Average daily gains during the suckling period for the 2 years' results combined showed that the native calves excelled with 1.86 lb., as compared with 1.80 lb. for the calves sired by Polled Shorthorns and Polled Devons and 1.87 and 1.64 lb. for the calves sired by Herefords and Aberdeen Angus, respectively. The native calves, however, graded Medium as compared with Good for the crosses. Weaning was at approximately 200 days of age. During a subsequent fattening period of the same duration the Polled Devon-sired calves excelled the others in rate of gain, 1.70 lb. per day, with Aberdeen Angus-sired second at 1.62 lb. and the Polled Shorthorn-sired and Polled Hereford-sired at 1.59 and 1.51 lb., respectively. During this period native calves made

average daily gains of 1.46 lb. and graded only Medium as contrasted with Good for the other groups. The native calves were less efficient utilizers of feed per unit gain than the crossbreds.

Legume silage vs. corn silage vs. legume hay for fattening heifer calves, G. A. BRANAMAN and G. K. DAVIS (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, pp. 106-110).—A second comparison of these feeds for fattening heifer calves produced equal gains in the 202-day feeding period. These results were somewhat less favorable for alfalfa silage than in the first trial (E. S. R., 82, p. 89). It was not necessary to add a protein-rich feed to the alfalfa hay ration to produce a satisfactory gain.

Finishing two-year-old steers with grass and grain, E. A. LIVESAY (*West Virginia Sta. Bul.* 296 (1940), pp. 12).—The general plan of the three experiments reported was to winter yearling steers on roughage and cottonseed meal (126 days), graze them from April to September (140 days), and follow with a 56-day finishing period. The three lots of steers in each trial were handled alike during the wintering period. Lot 1 received supplementary feed during the last 84 days and lot 2 for the last 56 days of the grazing period, while lot 3 received no supplement on grass. Lots 1 and 2 were finished on grass with heavy grain feeding but no roughage, while lot 3 was finished in dry lot on hay and grain. The amount of grain required to finish the 2-year-old steers by the three methods did not differ widely. Average dressing percentages for three groups were similar, as were the carcass grades. The animals in lots 1 and 2 each received some grain during the grazing season and consistently showed slightly better finish than the steers in lot 3. However, the margins of sale value over total costs consistently favored the lot 3 steers.

Finishing lambs on different proportions of corn and alfalfa, L. H. BLAKESLEE and G. A. BROWN (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, pp. 66-69).—Lambs hand fed on 70-percent hay and 30-percent corn rations gained about 3 lb. less during a feeding period of 103 days than lambs self-fed on similar rations supplying equal amounts of corn and alfalfa. Although the feed cost of the 70-percent alfalfa ration was less, the increased finish from the 50-percent corn ration more than offset the greater cost.

The feeding of camels, I. LEITCH (*Imp. Bur. Anim. Nutr. [Aberdeen], Tech. Commun.* 13 (1940), pp. 35).—The general requirements and methods followed in feeding camels are described. Notation is made of the importance of and daily need for about 5 oz. of salt for hand-fed camels unless saltwort pastures are available.

Swine management, W. C. SKELLEY (*New Jersey Stat. Cir.* 401 (1940), pp. 31, figs. 10).—This supersedes Circular 259 (E. S. R., 68, p. 77).

A plan of economical swine production for the Coastal Plain area, B. L. SOUTHWELL (*Georgia Coastal Plain Sta. Cir.* 7 (1940), pp. [13], figs. 11).—A plan for the production, management, and breeding of pigs under Coastal Plain conditions is presented.

Market classes and grades of swine, D. J. SLATER (*U. S. Dept. Agr. Cir.* 569 (1940), pp. 36, figs. 14).—Terms and classifications for swine under the present system of market classes and grades are defined, and the various classes of slaughter swine and feeder and stocker animals are described and illustrated.

Feeding soybeans to pigs: The effect on gains and a method of producing firm carcasses, E. H. HOSTETLER and J. O. HALVERSON (*North Carolina Sta. Tech. Bul.* 63 (1940), pp. 23).—The results of this investigation point toward the development of a method of producing firm carcasses from pigs fed soybeans. Rations containing 30, 40, and 50 percent of mature soybeans with corn and tankage until an average weight of 100 lb. was reached, followed by

corn and tankage containing 13 percent of cottonseed meal, were successfully fed to the attainment of an average weight of 230 lb. The carcasses graded firm, and these data were correlated with chemical determinations on the hardness of fat.

The influence of prolonged starvation on the composition of pig depot fats, T. P. HILDITCH and W. H. PEDELTY (*Biochem. Jour.*, 34 (1940), No. 1, pp. 40-47).—Two pigs fattened to 330 lb. live weight were fasted for 51 and 135 days, respectively, and showed weight losses of 65 and 143 lb. during these fasting periods. Data are presented on the total amounts of the various fatty acids in the fat depots and the percentage proportions of the fatty acids remaining after inanition. After 51 days' fast 59, 64, and 75 percent and after 135 days' 47, 35, and 38 percent of the respective outer, inner, and perinephric total fatty acids remained. The most striking feature of the results was the relatively small change in composition of the fats in corresponding depots during the course of the prolonged fast (*E. S. R.*, 84, p. 379).

[The nutritive value of dried foods for dogs], J. R. WAGNER and C. A. ELVEHJEM (*Wisconsin Sta. Bul.* 450 (1940), p. 34).—A progress report.

The digestibility of animal products and cereals by minks, J. K. LOOSLI, S. E. SMITH, and L. A. MAYNARD. (U. S. D. A., Cornell Univ., et al.). (*Amer. Fur Breeder*, 13 (1940), No. 6, pp. 32-34).—Digestion trials with minks on 13 different diets showed that fresh beef and horse meat were more digestible than dried or cooked meat or canned fish. Although carbohydrates and fats are good sources of energy, the carbohydrates were less digestible than proteins.

Egg shells are good poultry feed, H. L. WILCKE. (Iowa State Col.). (*U. S. Egg and Poultry Mag.*, 46 (1940), No. 10, pp. 617, 618).—In trials with both laying hens and growing chicks eggshell was found equal to oystershell as a calcium supplement in the rations, leading to the conclusion that price should be the determining factor in choosing between these supplements.

A study of the physical and chemical changes of the egg during its passage through the isthmus and uterus of the hen's oviduct, B. R. BURMESTER. (Univ. Ill.). (*Jour. Exp. Zool.*, 84 (1940), No. 3, pp. 445-500, figs. 7).—Data are presented on the changes in the weight, percentage of solids, and percentage of ash of the egg yolk during its passage through the isthmus portion of the uterus and oviduct. Measurements based on 47 yolks of eggs removed from the isthmus and uterus and 58 eggs manually expelled from the uterus are presented as ratios to the yolks of laid eggs. In general, the weight of the yolk and its ash and solids contents do not change while the egg passes through the isthmus and anterior uterus. The total weight of the white was only slightly if at all increased, but an appreciable amount of water was added, thus reducing the percentage of solids and ash. The volume of outer and inner thin white in the egg increased with curvilinear relation to the time the egg remained in the uterus, and the percentage of thick white decreased as a result of the increased amount of water added to the egg as it passed through the posterior portion. Active deposition of the shell membrane began in the isthmus and continued with the movement of the egg through it. Deposition of shell calcium apparently began in the anterior uterus. Changes in the composition of the white are thought largely responsible for the later changes in the composition of the yolk.

The preservation of eggs, R. B. HAINES (*Chem. and Indus.*, 59 (1940), No. 23, pp. 391-396, figs. 4).—This contribution from the Cambridge Low Temperature Research Station discusses the chief types of change which are liable to occur when eggs are stored and methods for controlling them.

Effect of high humidity on egg quality during short holding periods, F. P. JEFFREY and V. DARAGO (*New Jersey Stat. Bul.* 682 (1940), pp. 16, figs. 5).—Three tests were conducted in which fresh eggs were held at temperatures typical of fall (around 60° F.), winter (around 43°), and summer (around 80°) conditions. Two levels of relative humidity, the prevailing rate and a high rate (above 90 percent), were employed in each series. Eggs were examined for loss in albumin height, loss of weight, and degree of shell mottling at 2-day intervals up to 14 days. Interior egg quality as measured by height of the thick albumin was little affected by the relative humidity, whereas temperature markedly affected the rate of quality decline. High relative humidity tended to reduce the rate of evaporation of the egg content and reduced the incidence of severely mottled shells. Degree of shell mottling was not related to height of the thick albumin. Both degree of shell mottling and size of the air cell were measures of the rate of evaporation. The latter is recommended as a measure for this factor in the candling and grading of eggs. Attempts to maintain relative humidity of 90 percent or more in the egg storage room were not practical under the conditions of these experiments.

The development of mold on cold storage eggs and methods of control, W. L. MALLMANN and C. E. MICHAEL (*Michigan Sta. Tech. Bul.* 174 (1940), pp. 34, fig. 1).—A detailed report of research previously noted (*E. S. R.*, 83, p. 237).

Frozen storage of poultry.—IV, Further observations on surface drying and peroxide oxygen formation, W. H. COOK and W. H. WHITE (*Canad. Jour. Res.*, 18 (1940), No. 10, Sect. D, pp. 363–370, fig. 1).—Continuing these studies (*E. S. R.*, 82, p. 809), a package for frozen poultry capable of being ventilated during chilled storage but sealed to prevent surface drying during frozen storage is described which satisfactorily maintained the desired humidity of the pack. Experiments with a jacketed room in which the cooling coils were separated from the storage space indicated that this procedure does not prevent surface drying of boxed goods. Delay between slaughter and freezing accelerated the development of rancidity in the fat of poultry during subsequent frozen storage, but the free fatty acid content was seldom affected unless extensive microbial development occurred prior to freezing.

Concentrate feeding of broad breasted Bronze turkeys, E. I. ROBERTSON and L. A. WILHELM. (*Wash. Expt. Sta.*). (*U. S. Egg and Poultry Mag.*, 46 (1940), No. 10, pp. 597–600, 639, 640).—Feeding practices for growing turkeys compared in this experiment were (1) all-mash ration with birds confined, (2) all-mash ration on range, (3) a high-protein concentrate plus free choice of corn, wheat, oats, and barley on range, and (4) developing mash plus free access to a mixture of whole grains. Pens of both toms and hens were carried from 8 to 28 weeks of age. The feed required per pound of gain over the entire period was for toms 5.05 lb. .461, 3.84, and 4.83 and for hens 5.22, 5.28, 4.89, and 4.86 lb. for groups 1 to 4, respectively. The hens utilized feed as efficiently as the toms to 16 weeks of age. The toms receiving the protein concentrate plus free choice of grains showed highest final weight, most efficient feed utilization, and lowest feed cost per pound of gain. The results with hens were similar except that the final weight of this group was slightly below that of the birds receiving the all-mash ration. Grain consumption under the free-choice plan was wheat 64 percent, corn 25, oats 10, and barley 1 percent.

Feeding and confinement rearing experiment with turkeys during 1939, F. N. BARRETT, C. G. CARD, and A. BERRIDGE (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, pp. 85–92).—Studies of free-choice feeding of crossbred small-type and standard Bronze turkeys on corn, wheat, oats, and barley with mash

showed that oats was preferred to the other grains during a 24-week feeding period in confinement. Barley was eaten in rather large amounts during the first 4 weeks, but consumption of this grain later decreased. Wheat was preferred to corn. A mash containing fish meal in place of wheat flour middlings gave highly satisfactory results. The ♂ turkeys made more rapid gains and more efficient feed utilization than ♀s.

DAIRY FARMING—DAIRYING

[Investigations with dairy cattle and dairy products in Montana], J. A. NELSON and D. V. KOPLAND (*Montana Sta. [Bien.] Rpt. 1939-40, pp. 25, 26, 53, 54*).—Studies, for which results are briefly noted, include the effect of pasteurization on the flavor of market milk, methods of improving cultured butter-milk, the influence of certain weeds consumed by the cow on milk flavor, raising dairy calves on skim milk powder, and the effect on the dairy herd of the continuous use of sires which transmit a high level of productive inheritance.

[Dairy feeding investigations in Wisconsin], I. W. RUPEL, G. BOHSTEDT, M. I. WEGNER, E. B. HART, A. N. BOOTH, W. H. PETERSON, F. W. DUFFEE, B. C. JOHNSON, and W. A. KING (*Wisconsin Sta. Bul. 450 (1940), pp. 20-23, figs. 2*).—Results are reported on the utilization of urea by lactating cows, in vitro conversion of nitrogen to protein, and the use of corn meal, molasses, and phosphoric acid as preservatives for grass silage.

The length of the intestine of calves and its bearing on the absorption of the nutrients from the chyme, D. ESPE and C. Y. CANNON. (Iowa Expt. Sta.). (*Jour. Dairy Sci., 23 (1940), No. 12, pp. 1211-1214*).—Data are presented on the length of the intestines of five calves ranging in age from 5 to 12 mo. Average in vivo and post-mortem lengths were, respectively, 21 ft. 5 in. and 69 ft. 10 in. for the small intestine and 7 ft. 2 in. and 15 ft. 9 in. for the large intestine. It appeared that variations in the ratio between body length and length of intestines depended more on individuality than upon the age of the calf. Based on a review of available information, it is concluded that while the progress of the chyme through the calf intestine is comparatively rapid the relatively greater length of this organ in ruminants allows for proper absorption of the nutrient if it is thoroughly comminuted in the rumen.

Report of the Chief of the Bureau of Dairy Industry, 1940, O. E. REND (*U. S. Dept. Agr., Bur. Dairy Indus. Rpt., 1940, pp. 53*).—Dairy cattle investigations at the Beltsville, Md., Research Center and field experiment stations for which results are reported include breeding experiments with purebred dairy cattle, methods of preserving bull semen, the prevention of calf scours, various anatomical relationships in dairy cattle, the suspensory apparatus and circulatory system of the cow's udder, methods of ensiling forages and the feeding value of the silages, the grazing value of numerous types of permanent and temporary pastures, the man-labor requirement for handling dairy herds, costs of artificially dehydrating hay, all-roughage v. roughage and limited grain feeding of dairy cows and growing heifers, the use of liquid manure on pasture, the use of short-wave diathermy in the treatment of mastitis, numerous phases of the physiology of reproduction and lactation, and the gonadotropic activity of certain plant materials.

Nutrition investigations include the relation of vitamin E to nutritional muscular dystrophy, the hydroxyamino acids in proteins, carotene requirements for normal reproduction in cattle, the vitamin A requirements of young calves, the carotene content of corn silage and of alfalfa, nutritional deficiencies in poor-quality hay, and nutrition and lactation studies with rabbits.

From investigations with dairy products results are noted on various phases of the chemistry and bacteriology of milk, particularly the vitamin requirements of bacteria and the fat acid composition of milk fat; methods of utilizing dairy byproducts in ice cream and the whipping properties of ice cream mixes; new industrial and food uses for dairy byproducts; cheese quality improvement; methods of detecting mastitis infection; the effect of pasteurization on goat's milk; factors affecting the activation of milk phosphatase; the effects of homogenization on curd tension of milk; the relation of curd tension to digestion; and relation of curd size to curd tension and digestibility.

Station dairy research is widely diversified in nature (*Farm Res. [New York State Sta.]*, 7 (1941), No. 1, pp. 4, 12, figs. 2).—A brief description of the dairy research activities of this station, with particular reference to cheese production, ice cream manufacture, and dairy herd improvement.

The "in vitro" conversion of inorganic nitrogen to protein by microorganisms from the cow's rumen, M. I. WEGNER, A. N. BOOTH, G. BOHSTEDT, and E. B. HART. (*Wis. Expt. Sta.*). (*Jour. Dairy Sci.*, 23 (1940), No. 11, pp. 1123-1129).—Through in vitro experiments in which synthetic media were inoculated with juice expressed from bovine rumen contents it was demonstrated that inorganic nitrogen is converted to protein through action of bacteria from the cow's rumen. It was necessary to maintain a relatively high pH of the media through use of a calcium carbonate buffer to permit this reaction. The optimum pH range was from 5.5 to 7. Ammonium carbonate and urea were utilized by the rumen organisms with equal efficiency. Corn molasses, glucose, and starch were equally efficient in influencing nitrogen conversion, but cellulose was not an acceptable carbohydrate for this purpose. The decrease in ammonia could be accounted for by an increase in protein nitrogen. The level of protein in the media had a negative influence on the decrease in ammonia nitrogen. Rumen fluid exceeded the saliva in amylolytic activity, and saliva showed no proteolytic activity.

The fat metabolism of the mammary gland, J. C. SHAW and W. E. PETERSEN. (*Minn. Expt. Sta.*). (*Jour. Dairy Sci.*, 23 (1940), No. 11, pp. 1045-1056, figs. 2).—Findings reported are based on arteriovenous blood fat differences in over 200 simultaneously drawn arterial and venous blood samples, mainly from Holstein cows. Very little blood fat was taken up by the mammary gland immediately after milking. The amount used by the gland increased steadily up to 4 hr. after milking and then remained rather constant for a few hours. Blood fat absorption ceased after 15 hr. Calcium absorption followed similar trends. It appeared that passage into the lactating gland of blood fat and also calcium and acid-soluble phosphorus is associated with distension of the alveoli and the filling of the secretory cells with milk. Blood glucose and amino acids were not similarly affected but continued to be used in fairly constant amounts. Intravenous injection of oxytocin prevented the passage of blood fat into the gland. The quantity of blood fat used by the gland was sufficient to account for all milk fat, absorption of plasma fat being limited to neutral fat and/or cholesterol fractions.

[Experiments with dairy products in Wisconsin] (*Wisconsin Sta. Bul.* 450 (1940), pp. 1-14, 24, 25, figs. 7).—Studies for which results are briefly reported include methods of packaging natural cheese, including canning, and a new method of hooping and draining brick cheese, by W. V. Price; the effect of washing the curd in the manufacture of brick cheese, by J. C. Garey, E. M. Foster, and W. C. Frazier; methods of handling Swiss cheese starters, by R. M. Stern and Frazier; the relative vitamin D potency imparted by irradiation to the surface and submerged parts of a flowing film of milk, by H. H. Beck, K. G.

Weckel, and H. C. Jackson; tests for measuring milk losses during the evaporation process, by H. H. Sommer, T. L. Forster, and J. W. Knechtges; methods of preventing coagulation of homogenized milk used for cooking, by H. Hollender and Weckel; the protective properties of various types of containers against sunshine flavor in milk, by J. C. Flake, Weckel, and Jackson; methods of determining the viscosity of cream, by F. M. Skelton and Sommer; the comparative nutritive value of whole milk and filled milk, by E. G. Schantz, E. R. Boutwell, C. A. Elvehjem, and E. B. Hart; and the stability of vitamin A and riboflavin in irradiated milk, by W. H. Peterson and A. C. Dornbush.

Composition of goat milk of known purity, H. C. LYTHERG (*Jour. Dairy Sci.*, 23 (1940), No. 11, pp. 1097-1108).—Based on the chemical analyses of milk samples from 335 individual goats, data are presented on the average composition and range in composition of milk collected during 7 separate periods. The February and August samples, respectively, contained an average percentage of total solids of 14.56 and 11.44, fat 5.13 and 3.37, lactose 4.87 and 4.32, protein 3.97 and 2.99, and ash 0.85 and 0.78. Included are data on freezing point depression, copper serum reaction, and acetic serum ash. Due to greater variance in serum constants and freezing point, watering and skimming could be less certainly detected in goat's milk than in cow's milk. Summer-produced goat's milk was relatively very low in total solids. The phosphatase test proved of little value in detecting inadequate pasteurization of goat's milk, since the enzyme was inactivated at pasteurization temperature considerably before expiration of the legal holding time.

The composition of dog's milk, H. D. ANDERSON, B. C. JOHNSON, and A. ARNOLD. (Wis. Expt. Sta.). (*Amer. Jour. Physiol.*, 129 (1940), No. 3, pp. 631-634, fig. 1).—Samples of dog's milk obtained between the eighteenth and thirtieth days of lactation were chemically analyzed. These samples contained an average of fat 83 percent, crude protein 7.5, sugar 3.7, ash 1.2, and total solids 22.6 percent. No carotene was detected in any of the milks, but they contained an average of 2.6 γ and 6.9 γ per cubic centimeter of vitamin A and flavin, respectively. Trends in composition with advance in lactation are discussed.

Evaluation of methods for grading milk, E. H. PARFITT (*Ind. State Dairy Assoc. Ann. Rpt.* 50 (1940), pp. 56-60).—The relative efficiency of the plate count, the direct microscopic count, and the methylene blue reduction test for determining the sanitary properties of milk and especially the adaptations of each are discussed.

Effect of pasteurization upon the properties of milk, R. F. HOLLAND (*Farm Res. [New York State Sta.]*, 7 (1941), No. 1, pp. 8, 9, fig. 1).—A comparison of pasteurization temperatures ranging from 140° to 175° F., with a range of holding time at each temperature, gave evidence that 170° for 1 sec. was most desirable with reference to the destruction of bacteria, inactivation of phosphatase, and the effect on creaming ability of milk.

Thermotolerant bacteria in pasteurized milk: A review of the literature, J. L. HILFMAN (*Jour. Dairy Sci.*, 23 (1940), No. 11, pp. 1143-1160).—This comprehensive review cites 74 references.

A comparison of the results obtained from incubating bacteriological plates at 32° C. and 37° C. on the bacterial counts of milk, A. C. FAY and A. W. HOWARD (*Jour. Dairy Sci.*, 23 (1940), No. 11, pp. 1069-1072).—Comparative counts were made on 253 samples of raw milk from grade A dairies, 777 samples of laboratory-pasteurized milk, 140 samples of raw milk from tank car shipments, and 142 samples taken from tank cars and pasteurized in the laboratory. Comparative results are tabulated to show the number of samples falling in the different ranges of counts at the two incubation temperatures.

While counts of all milks tended to be somewhat higher at 32° incubation temperature, it is concluded that producers of grade A milk were not sufficiently penalized by the use of the lower temperature to warrant readjustment of the premium base.

Relation of surface tension of rancid milk to its inhibitory effect on the growth and acid fermentation of *Streptococcus lactis*, N. P. TABASSUK and F. R. SMITH. (Univ. Calif.). (*Jour. Dairy Sci.*, 23 (1940), No. 12, pp. 1163-1170, figs. 4).—Following the demonstration that rancidity lowered the surface tension of milk and that rancid milk exerted an inhibitory effect on the activity of lactic acid starters (E. S. R., 83, p. 240), experiments reported here confirmed the inhibitory effect of rancid milk on the growth and acid formation of *S. lactis* and established a causal relationship between the low surface tension of rancid milk and this effect. Under optimum conditions, appreciable growth of *S. lactis* occurred in rancid milk which increased the surface tension to a value approaching that of normal milk. This increase in surface tension apparently resulted from the utilization of surface-tension-lowering fat acids by *S. lactis* in the process of growth.

A study of the causes of periodic abnormalities of a high grade pasteurized milk supply, B. A. RUBIN and F. S. ORCUTT. (Va. A. and M. Col.). (*Va. Acad. Sci. Proc.*, 1938, pp. 42, 43).—An abnormality of whole milk, characterized by rapid acid liquefaction, was attributed to contamination with *Bacillus albolactis*. This organism proved to be very heat resistant and was not eliminated from milk by comparatively high pasteurization temperatures.

Control of flavor in milk heated to high temperature, I. A. GOULD. (Mich. Expt. Sta.). (*Milk Dealer*, 29 (1940), No. 8, pp. 70, 72, 74-76; *abs. in Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, p. 116).—As an outgrowth of earlier findings (E. S. R., 80, p. 99; 81, p. 563), the possibility of using in combination added copper and homogenization of high-temperature treated milk to control cooked and oxidized flavors was investigated. Milk heated to 180° F. and then treated with small amounts of copper salts invariably lost its cooked flavor and became oxidized. However, when from 1.5 to 2 p. p. m. of copper were added to the heated milk and the milk then homogenized, the cooked flavor disappeared within 24 hr. and an excellent flavor with no evidence of oxidized flavor development was maintained during 120 hr. of subsequent storage. When less copper was added the cooked flavor disappeared less rapidly. Similar results were obtained when homogenization preceded the addition of copper. The practical applications of these findings are discussed.

Studies on the source-origin of activated flavor in milk, J. C. FLAKE, H. C. JACKSON, and K. G. WECKEL. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 11, pp. 1079-1086).—Continuing this line of investigation (E. S. R., 81, p. 413), various constituents of milk including a series of protein hydrolyzates prepared from casein were subjected to ultraviolet irradiation. Riboflavin and other dialyzable substances when irradiated failed to produce any semblance of the typical activated flavor. Inconclusive results were obtained on the protein hydrolyzates although tryptone developed a flavor somewhat similar to the typical activated flavor. Irradiation of the amino acids indicated that cystine, methionine, tryptophan, and histidine may be important contributors to the activated flavor of milk.

Isolation of substances responsible for the activated flavor of milk, J. C. FLAKE, H. C. JACKSON, and K. G. WECKEL. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 11, pp. 1087-1095, figs. 3).—A highly volatile flavor and odor material believed responsible for the typical activated flavor produced in milk by irradiation was obtained by steam distillation of an intensely

irradiated casein preparation. The flavor and odor materials recovered in the distillate were adsorbed on activated charcoal and eluted with ether, but the quantities thus secured were too small to permit analysis. Evidence pointed to the possible role of sulfur compounds in formation of the activated flavors.

Effect of the properties of the fat and of the fat globule surface on lipolytic activity in milk, V. N. KRUKOVSKY and P. F. SHARP. (Cornell Univ.). (*Jour. Dairy Sci.*, 23 (1940), No. 11, pp. 1109-1118, figs. 6).—Lipolytic activity as measured by the increase in acid degree of the fat was determined on combinations of skim milk and cream covering a wide range in fat content, on milk containing various fat fractions obtained by stepwise cooling of milk oil, and on milk containing resurfaced fat globules. Cooling, warming, and recooling proved effective in increasing lipolysis in raw cream as well as in raw milk. While total lipolytic action increased with fat content up to 45 percent, the acidity per unit of fat and per unit of plasma increased with fat content only up to 8-10 percent and then remained constant or decreased. The lower the temperature required for crystallization of the fat fraction, the greater was the increase in acidity when used as a substrate for milk lipase, indicating that the rate of lipolysis is dependent on the melting point of the fat or the degree of solidification of the fat at a given temperature. Resurfacing the fat globules accelerated the lipolysis of milk fat, but cooling, warming, and cooling such material failed to further increase lipolysis. The pronounced influence of the conditions at the fat-plasma interface on lipolytic action in milk and cream was clearly demonstrated.

Inactivation of milk lipase by dissolved oxygen, V. N. KRUKOVSKY and P. F. SHARP. (Cornell Univ.). (*Jour. Dairy Sci.*, 23 (1940), No. 11, pp. 1119-1122, figs. 2).—Comparing the lipolytic activity of normal and deaerated milk in the presence of varying amounts of copper, it was found that dissolved copper caused no inactivation of lipase in whole milk in the absence of oxygen. Lipase was susceptible to inactivation by dissolved oxygen, and this reaction was accelerated by dissolved copper and by heat.

The effect of commercial practices on ascorbic acid and dehydroascorbic acid (vitamin C) in milk, W. W. WOESSNER, K. G. WECKEL, and H. A. SCHUTTE. (Wis. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 11, pp. 1131-1141).—The total ascorbic acid and dehydroascorbic acid contents of mixed herd milk were determined at various stages in the processing and delivery of the milk. Pasteurization by the holder method was found to cause a 20-percent loss in total ascorbic acid. The dehydroascorbic acid proved to be highly heat labile, so that the rate of destruction of total ascorbic acid depended on the rate at which ascorbic acid was transformed to the reversibly oxidized form. Ascorbic acid in the absence of copper was highly heat stable. Contamination with the copper and exposure to light markedly accelerated the rate of loss of total ascorbic acid. Tubular preheating, clarification, homogenization, cooling, and light-protected delivery, individually or collectively, caused no loss in vitamin C potency. The production of a vitamin C-fortified milk through addition of ascorbic acid proved practical only when rigid exclusion of copper and protection from light were practiced. The addition of sodium metaphosphate or pancreatic enzyme to milk had neither a protective nor detrimental effect on vitamin C, although the latter prevented the development of copper-induced oxidized flavor.

Canning of evaporated and sterilized natural milk, with special emphasis on the most common problems and difficulties encountered, D. B. GAROZ (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 3, pp. 269-285, pls. 2).—Methods which have proved applicable to Philippine conditions are described.

Effect of salt on the keeping quality of cream, W. J. CAULFIELD, F. E. NELSON, and W. H. MARTIN. (Kans. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 12, pp. 1215-1227, figs. 4).—Samples of fresh cream to which were added 0, 7, 10, 13, and 16 percent of salt were held for 10 days at temperatures of 60°, 70°, 82°, and 90° F. Tests including organoleptic grading, acid titration, formal titration, and direct microscopic bacterial counts were made at frequent intervals on all samples. The effectiveness of salt in preventing deterioration varied with time and temperature. At least 10 percent of salt was required to prevent cream from becoming second grade when held for 10 days at 60° or 70° or for 5 days at 82° and 90°. When cream was held for 0, 3, 4, 5, and 6 days at 70° before 13 percent of salt was added, the delayed addition of salt failed to prevent further deterioration of the cream. Butter churned from cream to which 13 percent of salt was added at the beginning of the 10-day storage period scored 2 to 5 points higher than did butter produced from control lots of the same cream without salt. In no case did butter from the salted cream contain more than 2.5 percent salt. A modification of the Babcock test applicable to salted cream is described.

The neutralization of cream for buttermaking.—I, The accuracy of acid reduction by various neutralizers. II, The speed of acid reduction and the influence of pasteurization temperature, R. C. TOWNLEY and I. A. GOULD. (Mich. Expt. Sta.). (*Canad. Dairy and Ice Cream Jour.*, 19 (1940), Nos. 5, pp. 54, 56, 58, 60, figs. 3; 6. pp. 50, 52, 54, 56; abs. in *Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, pp. 114, 115).—This contribution is a more detailed report of research previously noted (E. S. R., 82, p. 530). It is further noted that at higher acidity ranges the acid reduction was often somewhat greater than expected on the basis of calculation, whereas at the lower ranges the acid reduction was less than expected. The reaction between the neutralizers and cream was practically complete after 5 min. Pasteurization had no appreciable effect on the acid reduction of cream treated with either sodium hydroxide or calcium lime. However, with carbonates or magnesium lime the acid reduction due to pasteurization became progressively greater as the amount of neutralizer added to cream increased.

pH values of cream, butter, and buttermilk as affected by different neutralizers, R. C. TOWNLEY and I. A. GOULD (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, pp. 69-72, fig. 1).—In connection with the above-described studies, data were gathered on the pH of the corresponding buttermilks. The pH of butter sera and buttermilk maintained a rather uniform relationship to the pH of the corresponding cream, averaging 0.15 and 0.10 pH unit, respectively, lower than that of the corresponding cream.

Method for determining losses of butter fat in the creamery, M. MORTENSEN. (Iowa Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 11, pp. 1073-1077).—A series of mathematical formulas, based on predetermined volume and composition data, are presented for computing butterfat losses at various steps in the handling of cream and churning of butter.

A study of fresh and frozen plain, superheated, and sweetened condensed skimmilk for ice cream, L. K. CROWE and H. H. WINN. (Nebr. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 12, pp. 1187-1199).—Plain and superheated condensed skim milks, each containing 30 percent of total solids, and sweetened condensed skim milk containing approximately 60 percent of total solids were prepared as described. Samples of each were frozen and removed after 1, 2, and 3 months' frozen storage for examination. The plain and sweetened condensed products underwent little change during storage except that the solubility of the former slowly decreased as the storage period progressed. The

superheated product declined rapidly in solubility and showed marked protein precipitation after 3 months' storage. Each of the three products were used when fresh and after 1, 2, and 3 months' storage as sources of serum solids in ice cream mixes. Data are presented on the chemical and physical characteristics, pH, viscosity, and whipping ability of the mixes as affected by the condensed products used. In general, there was no appreciable difference in the flavor scores of the ice cream which could be attributed to the type of condensed skim milk used and whether fresh or frozen. The three fresh condensed products also gave ice creams of similar body and texture. In all cases, body and texture scores of ice cream were slightly lowered as a result of 1 month's frozen storage of the condensed product. Melting time and characteristics of the melted products are discussed.

New York State Limburger cheese has reputation for quality, M. W. YALE (*Farm Res. [New York State Sta.], 7 (1941), No. 1, pp. 2, 3, figs. 2*).—A brief account of the Limburger cheese industry in New York with reference to research on the pasteurization of milk used in the manufacture of such cheese (*E. S. R., 84, p. 99*).

VETERINARY MEDICINE

[Work in animal pathology and parasitology by the Colorado Station] (*Colorado Sta. Rpt. 1940, pp. 17, 19, 22, 23, 34-39, 40*).—The work of the year reported (*E. S. R., 82, p. 818*) relates to the nutritional control of mastitis; poisonous plants, including *Oxytenia acrota*, large buttercup and small buttercup, gum weed, blue-green algae (*Anabaena flos-aquae*), and *Suckleya suckleyana*; nitrate content of oats hay and beet tops; vaccination for sore mouth of lambs; coccidiosis of lambs and dogs; parasites of lambs and cattle; effect of the H-ion concentration on over-eating and diseases of the digestive tract; effect of lack of iodine in the ration upon the thyroid gland in lambs; urinary calculi; Bang's disease; pullorum disease and paratyphoid infections in poultry; and histological studies on thyroid tissues from rats and fowls.

[Abstracts of theses on animal pathology and parasitology] (*La. State Univ. Bul., n. ser., 32 (1940), No. 1, pp. 28, 85-88*).—These include Inherent Resistance of S[ingle] C[omb] White Leghorns to Iritis as a Manifestation of Fowl Paralysis, by W. Guidry (p. 28); Studies on the Bovine Blood Picture in Health and Under Parasitism, by E. Delaune (pp. 85, 86); and Trematode Parasites From Birds in Louisiana, by A. G. Humes (pp. 87, 88).

[Work in animal pathology by the Montana Station], H. MARSH and J. R. QUESENBERY. (*Coop. U. S. D. A. et al.*). (*Montana Sta. [Blen.] Rpt. 1939-40, pp. 58, 59, 63, 64*).—Reference is made to work with Bang's disease in range cattle, black disease and mastitis (bluebag) in sheep, and equine encephalomyelitis.

[Contributions on animal pathology and parasitology] (*N. Y. State Vet. Col. Rpt., 1938-39, pp. 67-183, figs. 8*).—Included in the contributions presented and not previously noted are: Some Diseases of the Genito-Urinary Systems, by H. J. Mills (pp. 67-75); Disease Problems of Duck Raisers, by K. F. Hilbert (pp. 161-164); The Value of Chemically-Killed Cultures for the Control of Cholera in Ducks (Second report), by K. F. Hilbert and H. Tax (pp. 165-167) (*E. S. R., 81, p. 114*); and Some Common Parasitism of Bovines Encountered in the Northeastern States, by D. W. Baker (pp. 175-183).

[Work in animal pathology by the Wisconsin Station]. (*Coop. U. S. D. A. et al.*). (*Wisconsin Sta. Bul. 450 (1940), pp. 23, 24, 29, 30, 34, 35, 42-45*).—The work of the year (*E. S. R., 83, p. 105*) includes the identification of the toxic compound which causes "sweet clover disease" of cattle, by H. A. Campbell,

K. P. Link, M. Stahmann, C. Huebner, and R. Overman; ichthyosis of chicks caused by lack of a vitamin, by D. M. Hegsted, J. J. Oleson, C. A. Elvehjem, and E. B. Hart; vitamin C deficiency in cattle lacking vitamin A, by W. A. King, P. Phillips, M. E. Nesbit, I. W. Rupel, and G. Bohstedt; prevention of "Chastek paralysis" of foxes, by A. I. Coombes, W. Wisnicky, and E. B. Hart; and tests proving the worthlessness of "Bowman's" and "3-V Tonic" as remedies for Bang's disease, by W. E. Cotton, J. M. Buck, A. B. Crawford, J. S. Healy, E. G. Hastings, B. A. Beach, and N. Clark.

[Viruses and the virus diseases of animals] (In *Handbuch der Virusforschung, I, II*, edited by R. DOERR and C. HALLAUER Wien (Vienna): Julius Springer, 1938, pt. 1, pp. 126-446, figs. 34; 1939, pt. 2, pp. 547-1357, figs. 4).—Among the subjects dealt with in this work of particular interest to the animal pathologist are: The Sizes of Viruses and Bacteriophages and Methods for Their Determination, by W. J. Elford (pp. 126-231); Inclusion Bodies and Their Relationship to Viruses, by G. M. Findlay (pp. 292-368); The Growth of Viruses on the Chorioallantois of the Chick Embryo, by F. M. Burnet (pp. 419-446); Natural and Experimental Transmission of Viruses [trans. title] (pp. 547-574) and The Propagation of Viruses in the Host [trans. title] (pp. 690-825), both by R. Doerr; Variation in Animal Viruses, by G. M. Findlay (pp. 862-947); The Viruses of Tumor-Producing Agents [trans. title], by O. Thomsen (pp. 994-1105); and Virus Species as Antigens and the Acquired Immunity to Virus Infections [trans. title] (pp. 1106-1291). A tabulated list of the known animal viruses is appended (pp. 1343-1357).

Rat virus enquiry report, including a note on the raticidal value of certain commercial and other chemical poisons, J. T. PARANJOTHY (*Inst. Med. Res., Fed. Malay States, Bul. 1* (1939), pp. [3]+23).

Demonstration of a capsule on *Brucella* cells, I. F. HEDDLESON. (Mich. State Col.). (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 4, p. 773).—This more detailed account (*E. S. R.*, 84, p. 245) includes a description of the technic employed in demonstrating the presence of a capsule on all smooth strains of species of *Brucella*. No success was met with in the attempt to stain the capsule on *Brucella* cells. The capsule may be removed from the cell by digestion with hot chloroform-ether mixture acidified with HCl. This treatment also destroys that part of the organism which is made visible by the usual staining methods. Preliminary studies in progress show that the capsular material is composed of lipids in close combination with a polysaccharide. Capsular swelling has not been demonstrated when organisms are incubated with specific serum. It is said that the rough form of *Brucella* also shows a capsule.

The behavior of *Brucella abortus* vaccine in various excipients, A. EICHHOFF, C. K. MINGLE, and F. M. MURDOCK. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 3-17).—Investigations having as their ultimate object the determination of the relative merits of *B. abortus* vaccines suspended in various excipients, particularly from the standpoint of induced immunological response, are reported, with the details given in 10 tables. The studies included the in vitro as well as the in vivo behavior of viable *Brucella* organisms in such excipients as liquid petrolatum, oil of sweet almond, lanolin, saponin, cholesterol, and physiological saline. Anticipated correlation between the action of various excipients on *B. abortus* in vitro and their effect in animal tissues was not possible. "While 50 percent lanolin in liquid petrolatum suspensions were sterilized within 96 hr. at 37.5° C., it was possible to isolate viable *Brucella* from vaccinal sites 85 days following inoculation of identical suspensions. No variations in general reactions, following animal

inoculation, can be associated with the use of various excipients studied. Furthermore, the transient character of these reactions is similar to that observed in saline suspended injections. Marked differences were noted in the persistence of local reactions following inoculation of *B. abortus* suspended in various excipients. These reactions may persist for a period of at least 5 mo. in the case of 50 percent lanolin-liquid petrolatum mixtures, in contrast to the rapid absorption which commonly occurs within 3 to 4 weeks following the administration of comparable bacterial suspensions prepared in physiological saline. *B. abortus* strain 19 may remain viable at the site of inoculation for at least 85 days following subcutaneous injection of saline suspended vaccine. This persistence of viability may be increased to at least 150 days by the use of 2 percent cholesterol in liquid petrolatum as an excipient. No significant differences were noted in the agglutinin response induced in cattle and rabbits as the result of *B. abortus* inoculations in which various excipients were employed. In no instance was any evidence of enhanced virulence observed in 10 cultures recovered at intervals of 50 to 97 days from vaccinal sites in cattle inoculated with *B. abortus* strain 19. Based on the theory that increased immunological response may be induced by retarded antigen absorption, 2 percent cholesterol in liquid petrolatum has shown sufficient promise to justify further study."

Prevention of goiter in farm animals, H. WELCH (*Montana Sta. Cir.* 160 (1940), pp. 5, figs. 4).—A revision of Circular 145 (E. S. R., 72, p. 825).

The resazurin test for detecting mastitis, R. R. RUSSELL, T. PALMER-JONES, and G. M. MORE (*New Zeal. Jour. Sci. and Technol.*, 21 (1939), No. 3A, pp. 161A-167A).—Account is given of the resazurin test, hitherto used mainly for milk grading, which has been found of value in the diagnosis of mastitis. An analysis of results obtained from 814 individual quarter samples demonstrates good agreement between the resazurin test and cultural and microscopic methods of diagnosing mastitis. The test is sensitive to the presence of streptococci, staphylococci, or leucocytes, but comparatively insensitive to the presence of micrococci in milk drawn aseptically from the udder. It is comparatively simple, rapid, and economical.

The efficiency of soaps and other disinfectants in destroying mastitis streptococci, E. C. McCULLOCH. (*Wash. Expt. Sta.*). (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 18-22, figs. 2).—Solutions of commercial soaps and soap powders at 40° C. and in the presence of 5 percent each of skim milk and broth culture of the organisms were found to be between two and three times as effective in killing mastitis streptococci in 1 min. as was phenol, and were as effective as 100 p. p. m. of the most active germicidal of several hypochlorites tested. "A soap containing cresols was no more germicidal than were the nonmedicated soaps, and the soaps containing mercury compounds were only slightly more effective. A soft soap usually called 'green soap,' tincture of green soap, and a coconut oil base liquid soap were found to be inferior germicides against mastitis streptococci. No correlation was observed between the germicidal efficiency of the mixture of soap solution, milk, and broth and the degree of alkalinity. Drene, said to consist largely of triethanolammoniumlauryl sulfate, which gave a final dilution near the neutral point, was effective in dilutions comparable with the solid soaps. High-test household lye, which probably kills by the hydroxyl-ion concentration produced, was found to be effective in dilutions of 1:300 and 1:500, which gave a final alkalinity of pH 11.22 to 11.18, but was much slower than the soaps in exerting germicidal action. Soap solutions in the concentrations usually obtained in lathering the hands with soap in warm water are effective disinfectants against mastitis streptococci

and may satisfactorily replace other disinfectants for the hands of the milkers and the teats of the cows. Household lye is the disinfectant of choice for dairy barns where it is especially necessary to destroy mastitis streptococci on the floors."

Acid agglutination in Salmonella group, H. OGONUKI (*Kitasato Arch. Expt. Med. [Tokyo]*, 17 (1940), No. 2, pp. 80-87).—Report is made of an investigation of the acid agglutination of the *Salmonella* group on the basis of the newer knowledge of their antigenic structures.

Studies on Thysanosome actinioides, II, F. X. GASSNER and F. THORP, JR. (Colo. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 36-48, figs. 13).—Report is made in this further contribution (E. S. R., 83, p. 249) of the discovery of an early embryonal stage in the life of the fringed tapeworm *T. actinioides*, in which embryonated ova are encased in heavy fibrous capsules.

Differentiation of the human and bovine types of tubercle bacilli and its significance, Y. WATANABE (*Kitasato Arch. Expt. Med. [Tokyo]*, 17 (1940), No. 2, pp. 65-73).

A note concerning the influence of zinc on the growth of tubercle bacilli on malate media, R. R. HENLEY. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 25, 26).

Man's greatest victory over tuberculosis, J. A. MYERS (*Springfield, Ill.: Charles C. Thomas*, [1940], pp. IX+419, figs. 31; rev. in *Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 765, pp. 613-619, fig. 1).—This work relates to achievements in the conquering of animal plagues, particularly bovine tuberculosis and its eradication in the United States, claimed to have been successfully concluded in November 1940. A foreword by J. R. Mohler and a bibliography of nine pages are included. The review is by L. A. Merrillat.

Two cases of undulant fever treated with sulphanilamide, R. J. G. MORRISON (*Jour. Roy. Army Med. Corps*, 75 (1940), No. 1, pp. 45-47).—A brief account is given of two cases of undulant fever successfully treated with sulfanilamide. In observations of agglutination reactions following administration of the drug a slow steady fall in the titer was noted.

A convenient field test for albuminuria, M. H. ROEPKE. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 765, pp. 602, 603).—Description is given of a simple field test for albuminuria in dairy cows, which is a slight modification of the usual sulfosalicylic acid tests.

The standardisation and interpretation of the agglutination test for Brucella infection in cattle, W. L. HINDMARSH (*Vet. Rec.*, 52 (1940), No. 48, pp. 832-835).

Calfhood vaccination as an aid in cooperative Bang's disease (=bovine brucellosis) control, J. R. MOHLER, A. E. WIGHT, and H. M. O'REAR. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 766, pp. 1-9).—This is a discussion of the progress of work in Bang's disease control and eradication and the presentation of a proposed policy involving official recognition of calfhood vaccination as an adjunct to the test-and-slaughter method employed during the 6 yr. that the cooperative campaign has been under way.

Preliminary observations on the duration of immunity in cattle vaccinated in calfhood with strain 19 of Brucella abortus, A. L. DELEZ. (Ind. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 765, pp. 581-583, 584).—In the work reported 15 heifer calves negative to the agglutination test for *B. abortus* were used in a study of the duration of the immunity in the second gestation that results from vaccination with *B. abortus* strain 19. Thirteen of the animals were carried through two gestation periods. Nine were vaccinated when from 4 to 6 mo. of age, and 4 were kept as controls.

"One mo. following vaccination the blood agglutinin titers of the vaccinated heifers varied from 1-100 to 1-500. During the first 5 mo. the titers dropped to 1-25 and 1-50. At the end of the first pregnancy the 9 principals delivered full-term living calves. The 4 controls also carried full-term calves, but 2 were born dead. Following exposures in the fifth and sixth month of the second pregnancy, 6 principals gave birth to full-term living calves. Two of the other principals delivered living calves in the middle of the eighth month and 1 early in the ninth month of gestation. *B. abortus* was demonstrated in the 3 animals that calved prematurely. At the termination of the second pregnancy 2 controls dropped dead calves and 1 a live calf in the eighth month of gestation. The fourth control aborted in the seventh month of pregnancy. *B. abortus* was demonstrated in the colostrum and fetal tissues of 3 controls, while material for bacteriological examinations was not obtained in the fourth control animal."

Acaprin in the treatment of piroplasmosis (=Texas fever), G. A. ROBERTS (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 765, pp. 599, 600, figs. 2).—Cases are reported which call attention to the rapid action of acaprin in the treatment of bovine piroplasmosis.

Bovine type of tuberculosis in sheep, G. T. CREECH. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 23-25).—The apparent extreme rarity of the bovine type of tuberculosis in sheep led to the reporting of a case.

Studies on organisms of the genus *Listerella*.—IV, An outbreak of abortion associated with the recovery of *Listerella* from the aborted foetuses, J. S. PATERSON (*Vet. Jour.*, 96 (1940), No. 8, pp. 327-332).—An outbreak of abortion in sheep is described in which *Listeria* (*Listerella*) (E. S. R., 83, p. 541) was recovered from the fourth stomachs of the aborted fetuses. No trace of infection was detected in the ewes. Intravenous injection of the organism into pregnant sheep was found to be followed by the localization of the bacteria in the uterus, fetal membranes, and fetus, finally causing expulsion of the fetus. The oral administration of cultures to similar sheep failed to provoke abortion. The possibility of certain cases of this affection of human infants being due to intra-uterine infection is discussed.

Treatment of trichostrongylosis (black scour) with copper sulphate and nicotine sulphate, H. M. GORDON (*Jour. Council Sci. and Indus. Res. [Austral.]*, 13 (1940), No. 3, pp. 169-172).

Intestinal worms in sheep (*Montana Sta. Cir.* 159 (1940), pp. 6, figs. 5).—A brief practical account of the roundworms and tapeworms in Montana sheep, symptoms characteristic of their infestation, diagnosis, and treatment.

Preliminary examination of the anthelmintic efficiency of certain compounds related to phenothiazine, H. M. GORDON and M. LIPSON (*Jour. Council Sci. and Indus. Res. [Austral.]*, 13 (1940), No. 3, pp. 173-177).—A preliminary study was made of compounds related to phenothiazine, including phenothiazone, diphenylamine, phenoxthine, phenarsazine chloride, and thionol, with the view to detecting anthelmintic properties, toxicity for sheep, and effect on larval development in fecal cultures from treated sheep. "Phenarsazine in doses of 0.04 to 0.12 gm. per kilogram body weight (1, 2, and 3 gm. for sheep of 25 kg. body weight) showed a high degree of efficiency against *Oe[sophagostomum] columbianum* but was very toxic for sheep, causing severe inflammation of the rumen and abomasum. Smaller doses were ineffective against *O. columbianum* and *H[æmonchus] contortus*. Phenoxthine in doses of 0.25 gm. per kilogram body weight (10 gm. for sheep of 40 kg.) showed a slight degree of anthelmintic efficiency against *H. contortus* and prevented development of larvae in fecal cultures from treated sheep. A dose of 0.5 gm. per kilogram (20 gm. for sheep of

40 kg.) was fatal. Doses of 0.15 gm per kilogram were ineffective against *H. contortus*. Phenothiazone (doses of 0.017 and 0.024 gm. in water injected into the abomasum of sheep of 25 kg. body weight and doses by mouth of 0.07 to 0.12 gm. per kilogram body weight) and thionol (doses of 0.13 gm. per kilogram body weight) showed no evidence of anthelmintic efficiency against *H. contortus*. Diphenylamine in doses of 0.03 to 0.12 gm. per kilogram body weight showed no anthelmintic efficiency against *H. contortus*. Doses of 0.4 gm. per kilogram body weight produced temporary reduction in the number of eggs of this parasite in fecal egg counts, development of larvae in fecal cultures was prevented on the day following treatment, and only a few larvae developed in cultures prepared on the next 2 days. None of the compounds tested showed the combination of high efficiency and low toxicity characteristic of phenothiazine, which in doses of 0.15 gm. per kilogram body weight shows a high degree of efficiency against *H. contortus*."

An effective treatment for the control of the sheep head grub *Oestrus ovis* in areas where the winters are cold, N. G. COBBERT. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 765, pp. 565-570, figs. 3).—Experimental treatment of sheep for this parasite with saponified cresol (Lycol), the details of which are tabulated, has shown a 3-percent solution to destroy the first-stage larvae while in the nasal passages and before they migrate to the frontal sinuses in the spring. The treatment applied during late fall and winter months consists in forcing a small stream of the solution, backed by from 35 to 45 lb. of air pressure, into the nasal passages while the head of the animal is held on the dorsal surface with the muzzle slightly elevated. By thus injecting about 1 fluid oz. of the medicament into each nostril of infested sheep approximately 90 percent of the existing infestation was eliminated by one treatment, and two such treatments, administered 5 days apart, eliminated 98 percent of the existing infestation.

A method of large-scale treatment of sheep for the destruction of head grubs (*Oestrus ovis*), N. G. COBBERT. (U. S. D. A.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 765, pp. 571-575, figs. 6).—Description is given of equipment through the use of which as many as 700 sheep were satisfactorily treated per hour for head grubs by the method above noted.

The source and availability of infective oöcysts in an outbreak of coccidiosis in lambs in Nebraska feedlots, J. F. CHRISTENSEN. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 27-35).—Observations made during an outbreak of coccidiosis among 16,000 feeder lambs in central Nebraska with a mortality of 3.4 percent are reported. An effort was made to determine the source of infective oöcysts and to evaluate drinking water and various feed materials as mediums for the sporulation and preservation of oöcysts and as contributors to the outbreak. Effective sterilization of old feed lots had taken place during the previous summer, and fresh fecal pellets from lambs that had just arrived were found to constitute the source of the clinical infection. Fecal contamination of the drinking water was considered to be negligible.

Mycotic stomatitis of goats, Z. DE JESUS (Philippine Jour. Anim. Indus., 7 (1940), No. 4, pp. 373-375, pls. 2).—An acute stomatitis of the goat was found to be due to the so-called thrush fungus *Monilia albicans* (Robin) Zopf (= *Oidium albicans* Robin).

Contagious pleuro-pneumonia of goats, E. O. LONGLEY (Indian Jour. Vet. Sci. and Anim. Husb., 10 (1940), No. 2, pp. 127-197, pls. 11, figs. 2).—Description is given of the symptoms, course, pathology, and histopathology of contagious pleuropneumonia of goats which occurs as a specific epizootic in the Madras

Presidency and is transmissible experimentally. The designation *Borrelomyces peripneumoniae capri* is proposed for the etiological agent.

Swine erysipelas in South Australia, N. ATKINSON and F. V. COLLINS (*Austral. Vet. Jour.*, 16 (1940), No. 5, pp. 193-199).—Swine erysipelas in its chronic, septicemic, and urticarial forms is described for the first time in South Australia.

Necrotic enteritis, V. R. GARDNER (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, pp. 63-66).—A practical summary of the results of work with a disease of swine sometimes confused with hog cholera and thought to rank first in importance as the cause of death losses in the herds of Michigan. A report of this disease by Davis, Freeman, and Madsen has been noted (*U. S. R.*, 83, p. 97). Experiments conducted with the affection, now known as infectious necrotic enteritis, have suggested that it is a secondary complication caused by the intestinal invasion of *Salmonella choleraesuis* and probably other organisms after the symptoms of a deficiency of nicotinic acid have developed.

Brucellosis in horses: A study of five cases without clinical symptoms, A. G. KARLSON and W. L. BOYD. (Minn. Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 765, pp. 576-580, figs. 2).—A bacteriological examination was made of the blood, urine, and feces of five horses that reacted to the agglutination test for *Brucella abortus* infection. Complete necropsies were performed on each animal, and various tissues were examined for the presence of the organism. *B. abortus* was isolated from the feces of two horses, another developed an abscess of the withers from which *B. abortus* was isolated, and the organism was isolated from a lesion in the sternum of a fourth horse and from lesions in the ribs of a fifth. It could not be demonstrated in the blood stream or urine of any of the horses. The observation that *B. abortus* may be eliminated with the feces in infected horses leads to the conclusion that such animals may be a source of infection for cattle.

The relation of brucellosis to periodic ophthalmia in Equidae, T. C. JONES (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 54-57).—Agglutination tests with the serums from 187 normal horses and 95 horses with periodic ophthalmia are reported. Although the series of cases studied is still relatively small, cultural and serological tests indicate that *Brucella* organisms are not constantly present in periodic ophthalmia. Organisms of the genus *Listeria* (*Listerella*) have been isolated from various organs in 14 out of 27 periodic ophthalmia cases studied culturally, but their significance has not been established.

Report on the relationship of thyroid activity to periodic ophthalmia, H. R. SEIBOLD. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 52-53).

Equine encephalomyelitis virus isolated from naturally infected *Triatoma sanguisuga* LeConte, C. H. KITSELMAN and A. W. GRUNDMANN (*Kansas Sta. Tech. Bul.* 50 (1940), pp. 15, fig. 1).—Report is made of the isolation of the virus of equine encephalomyelitis from a collection of the bloodsucking conenose made near Garrison, Kans., in June 1940 from a pasture in which two horses had died from the disease in 1939. This bug is reported as occurring commonly throughout that State and over much of the region where the disease has appeared. The work reported is considered to present the first known evidence of the finding of this virus in a bloodsucking insect in nature that is known to feed upon horses and also evidence that the virus is that of equine encephalomyelitis. Following collection, the insects were ground, centrifuged, and a bacteria-free filtrate obtained. The intracranial inoculation of guinea pigs with this filtrate resulted in the appearance of symptoms characteristic of a neurotropic virus and a 50 percent mortality in 6 days. The intracranial injection

of a second series of guinea pigs with a candle filtrate from the brains of the guinea pigs that had succumbed resulted again in a 50 percent mortality. Following the second passage, the virus remained fixed to cause 100 percent mortality in guinea pigs in 4 days. When first isolated, the virus appeared to be of low virulence but built up rapidly by serial passage. It also killed consistently following intranasal instillation and foot pad inoculation. Typing studies revealed the virus to be of the western form. The live insects from each group that were not used for direct isolation of virus were placed in separate cages and fresh susceptible guinea pigs were placed in contact with them to see if the insects could transmit the virus through biting and feeding. In one instance the guinea pig succumbed 28 days after entering the cage, and the virus was isolated from the brain. This virus is now in the third serial passage. The details of virus typing studies and the cross immunity work are given in appended tables. A brief history of equine encephalomyelitis, accompanied by a list of 15 references to the literature, is included, as is a note on the biology of the bloodsucking conenose, the latter by R. C. Smith (p. 14).

Immunization with non-infectious formalin derivative of purified equine encephalomyelitis virus protein, D. G. SHARP, A. R. TAYLOR, H. FINKELSTEIN, and D. and J. W. BEARD (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 4, pp. 650-652).

A note on immunologic reactions associated with equine infectious anemia, C. C. TORRANCE (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 63-65).—It was observed in horses affected with infectious anemia that elevations of temperature followed the subcutaneous injection of a preparation of globulins obtained from the serum of an infected horse but did not follow the injection of a similar material from a normal horse.

Some observations on nephritis in horses, R. F. LANGHAM and E. T. HALLMAN. (Mich. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 49-52, figs. 14).

Sulphanilamide treatment of streptococcal infections in horses, P. L. BAZELEY (*Austral. Vet. Jour.*, 16 (1940), No. 5, pp. 187-193).—Of 13 animals suffering from severe hemolytic streptococcal infections that were treated with sulfanilamide, 12 reacted to its administration, indicating a high value for the drug in the treatment of such infections. No benefit resulted from its administration in a case of strangles.

Preliminary studies on the effects of diet upon internal parasites in horses, C. E. HOWELL and M. A. STEWART. (Univ. Calif.). (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 58-62).—Horses that were kept on a vitamin A-deficient diet seemed to possess a greater susceptibility to *Parascaris equorum*. It is pointed out that the vitamin A-deficient experiment was incidental and not set up in such a way as to permit definite statements concerning the effects upon strongyle and *P. equorum* infections.

A review of the life history of *Spirocerca lupi* (= *S. sanguinolenta*), the esophageal worm of the dog, A. C. JERSTAD. (U. S. D. A.). (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 73-75, fig. 1).

Pentobarbital sodium as an anesthetic for minks, F. A. FUERMAN and E. T. STUEHR. (Oreg. Expt. Sta. et al.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 766, pp. 43, 44).—The subcutaneous administration of pentobarbital sodium was found to produce hypnosis satisfactory for the examination of minks after its administration intravenously had proved to be impractical. The minimum hypnotic dose administered subcutaneously as a 2-percent solution was determined as 22 mg. per kilogram of body weight.

A nonspecific lesion of the esophagus and oral cavity of the chicken. W. T. S. THORP, W. J. RUDY, and R. V. BOUCHEE. (Pa. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 78-81, figs. 4).—Report is made of 25 cases of nonspecific lesions of the esophagus and oral cavity of the chicken, gross and microscopical studies of which were made to determine the relationship, if any, of this condition to the nutritive status of the fowl. A limited bacteriological study of 15 cases of esophagitis indicated that the organisms found in the lesions were not the etiological agent.

[Check list of bacterial diseases of poultry] (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 764, pp. 510-526).—This is a second check list prepared by the committee of the American Veterinary Medical Association on poultry diseases. It follows that on virus diseases (E. S. R., 82, p. 392) and is based upon published reports of bacterial diseases, a list of 189 references to which is included.

The toxicity of various copper compounds and mixtures for domesticated birds. H. E. M. PULLAR (*Austral. Vet. Jour.*, 16 (1940), No. 5, pp. 203-213, figs. 2).—In further work (E. S. R., 84, p. 252) the author has determined the maximum daily intake of copper carbonate tolerated by birds as "0.06 gm. per kilogram live body weight for fowls and 0.029 gm. per kilogram live body weight for domestic mallards. It was not possible to produce copper poisoning in fowls supplied with a 1 in 4,000 dilution of copper sulfate in place of drinking water. Domestic mallards were fed a 1 in 4,000 dilution of copper sulfate, and fowls were given a 1 in 1,000 solution. The results were somewhat indefinite, but no obvious copper poisoning was produced. Wheat dry pickled with copper carbonate at the rate of 2 oz. per bushel is definitely unpalatable for fowls. Owing to the fact that it is unpalatable, fowls do not consume enough treated grain to provide a toxic dose." The question of the use of treated grains for food for birds is discussed.

Cultivation of avian pest virus in the embryos of chickens, ducks, and turkeys.—Preliminary report, J. D. GENEBOSE, R. A. ACEVEDO, and I. L. MENDOZA (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 4, pp. 357-363).—Avian pest virus was cultivated and made more highly concentrated in the embryos of the chicken, duck, and turkey. Whether this virus can be converted into vaccine remains to be determined.

Avian staphylococcosis. E. JUNGHEER and W. N. PLASTRIDGE. ([Conn.] Storrs Expt. Sta.). (*Jour. Amer. Vet. Med. Assoc.*, 98 (1941), No. 766, pp. 27-32, figs. 2).—Report is made of a study conducted during the course of several epizootic outbreaks of staphylococcal arthritis in chickens. A comparative study was made of 39 strains of staphylococci isolated from these outbreaks, also from fowl pox lesions and navel ill. A group of strains derived from joint and skin lesions and natural fowl pox lesions was characterized primarily by ability to produce alpha toxin and to coagulate rabbit plasma. Such cultures were lethal to 6-week-old chickens on intravenous injection and caused severe intradermal reaction in chickens and rabbits. Other cultures obtained from similar sources and from induced fowl pox lesions failed to produce alpha toxin and to coagulate rabbit plasma, but induced mild intradermal reaction in chickens and rabbits. The navel ill strains studied were comparatively inactive biochemically and failed to produce distinct reactions in chickens. In the determination of pathogenicity and etiologic significance of avian staphylococci, a positive rabbit plasma coagulase test definitely detects pathogenic strains. The wattle test in young chickens permits the recognition of mildly pathogenic strains among coagulase-negative organisms.

On avian tuberculosis, its frequency and role as a source of infection [trans. title], K. HILLERMARK (*Skand. Vet. Tidskr.*, 30 (1940), No. 9, pp. 918-931; *Eng. abs.*, p. 931).—The occurrence of tuberculosis in fowl, both in Sweden and

its different provinces and in other lands, is considered, together with its occurrence in man and domestic animals.

A new disease in fowls (infectious laryngo-tracheitis) [trans. title], H. MAGNUSSEN (*Skand. Vet. Tidskr.*, 30 (1940), No. 6, pp. 629-637, figs. 3; *Eng. abs.*, pp. 636, 637).—The occurrence of infectious laryngotracheitis in a flock of fowls near Lund, Sweden, is reported. The mortality was nearly 50 percent.

Studies on fowl leukosis: Transfer with fractions obtained by ultracentrifugation of leukemic plasma and bone-marrow extracts, A. KIRSCHBAUM, K. G. STERN, and C. W. HOOKER (*Yale Jour. Biol. and Med.*, 18 (1940), No. 1, pp. 1-14).—Work with the filtrable agent of fowl leukosis is reported. The sedimented material did not appear to possess a greater total activity than the material from which it was derived (crude marrow extract or plasma). None of the agent was sedimented at 6,000 r. p. m. ($\frac{1}{2}$ hr.). Sedimentation was incomplete at 30,000 r. p. m. ($\frac{1}{2}$ to 1 hr.). The material responsible for the induction of leukosis was not completely sedimented at a single speed, indicating a variation in size of the particles associated with activity of the agent. As sedimented from crude marrow extracts, the agent was not filtrable. The resistance to both cells and agent appeared to increase with age. Susceptibility to filtrable agent plus leukemic cells (blood) or washed cells was greater than to the agent alone. Although activity of the agent manifested itself first in the bone marrow, intra-amniotic inoculation of 7-day embryos, before the appearance of bone marrow, resulted in the development of leukemia after hatching.

Identification of *Salmonella pullorum* colonies with immune serum by means of a macroscopic plate test, H. J. STAFSETH and A. C. CORBUTT. (Mich. Expt. Sta.). (*Amer. Jour. Vet. Res.*, 1 (1940), No. 1, pp. 76, 77).—It is concluded that the macroscopic plate test will differentiate *S. pullorum* colonies from those of *Salmonella* and other organisms except *Shigella gallinarum*. The fact that these two organisms give identical reactions with this test is no disadvantage from a practical standpoint. Such cross reactions occur in the accepted agglutination tests now employed in the control of pullorum disease, and some investigators consider *S. gallinarum* merely a variant of *Salmonella pullorum*, thus making pullorum disease and fowl typhoid one problem. The practical importance of shortening the time required for diagnostic procedures is considered too obvious to warrant comment. If there are no colonies of sufficient size to make this procedure possible, agar slant cultures must be made from the available colonies, and the antigen can then be taken from them after from 15 to 24 hr. By so doing, sufficient time and materials can be saved to make this method of practical value.

Salmonella suispestifer infection in canaries, I. E. ALTMAN (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 765, p. 601).—Report is made of what is thought to be the first recorded case of *S. suispestifer* infection in canaries.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations by the Arkansas Station] (*Arkansas Sta. Bul.* 405 (1940), pp. 13-16, figs. 2).—An experimental low-cost four-room frame house (E. S. R., 82, p. 574) is described by D. G. Carter; also a home-made walk-in type refrigerator of 220 cu. ft. net inside volume built at a cost of \$1.66 per cubic foot. A study of other sources of water for rice irrigation to replace or supplement the gradually declining well supply is by K. Engler.

[Agricultural engineering investigations by the Colorado Station]. (Partly coop. U. S. D. A.). (*Colorado Sta. Rpt.* 1940, pp. 51, 52-55).—Data on high-strength wire for concrete reinforcement has been obtained by A. R. Legault;

on a photographic method of making snow surveys by M. Parshall et al.; and on single seed ball planting and storage losses in beet piles.

[Agricultural engineering investigations by the Montana Station], O. W. Monson (*Montana Sta. [Blen.] Rpt. 1939-40, pp. 36, 37*).—Work on home-made water-lifting devices and water-power utilization, water-supply studies based on snow surveys, and return flow and duty of water investigations is briefly reported.

[Agricultural engineering investigations at the Wisconsin Station] (*Wisconsin Sta. Bul. 450 (1940), pp. 64-68, figs. 3*).—Notes are given on forage harvesters which speed up grass silage making, as tested by F. W. Duffee, a home-made electric brooder as improved by H. D. Bruhn, and windrowing before combining as studied by Duffee.

Surface water supply of the United States, 1938.—Part 3, Ohio River Basin (*U. S. Geol. Survey, Water-Supply Paper 853 (1940), pp. VII+418, pl. 1*).—This paper records measurements of stream flow in this basin for the year ended September 30, 1938.

Ponds for farm water supply, J. B. Davidson and C. H. Van Vlack (*Iowa Sta. Bul. P17, n. ser., (1940), pp. 493-508, figs. 11*).—This bulletin is a review of the problems involved in the establishment and use of farm ponds and offers suggestions for their location, construction, and maintenance.

As a basis for estimating required pond capacity, the daily consumption per head of various livestock and per person in the use of a domestic water supply is stated. Capacities of round ponds having depths at the spillway of from 8 to 20 ft. and a bank slope of 3:1 are tabulated, together with water available for use, calculated on the basis of 54 percent loss by evaporation and seepage, and the drainage area needed to maintain a pond of each of the sizes tabulated. It is pointed out that run-off in drought years should be the basis for determining the watershed area required, and it is considered safe to accept an annual run-off figure of 2 in. as such a basis. The tabulated drainage-area requirements are, therefore, based upon an annual 54,000 gal. per acre, of which 25,000 gal. (46 percent) is estimated available for use. Surveying to determine high-water line and size of dam, earth-dam construction, sod and masonry spillways, outlet pipes, fences, etc., are also taken up.

Small irrigation pumping plants, C. Rohwer and M. R. Lewis. (Coop. Colo. and Oreg. Expt. Stas.). (*U. S. Dept. Agr., Farmers' Bul. 1857 (1940), pp. [2]+30, figs. 10*).—This publication supersedes Farmers' Bulletin 1404 (E. S. R., 51, p. 483), which dealt only with wells as sources of irrigation water. The present publication deals also with the pumping of irrigation water from ponds, reservoirs, and streams, giving information designed to provide owners and operators of such farms as can practicably be irrigated with some indications of initial and operating costs, legal requirements, suitability of the available soil and water supply, and the sort of plant and equipment likely to be most satisfactory.

Tile drainage not advocated for land overlaying an artesian basin, W. Gardner (*Farm and Home Sci. [Utah Sta.], 1 (1940), No. 4, p. 5, fig. 1*).—This is a popular summary of model experiments showing that land overlaying an artesian basin can be adequately drained by tile only if the tile lines are laid so deep and so close together as to make the cost prohibitive. Pump wells, making the excess water available for irrigation, are considered to offer a practicable solution of the problem of the drainage of such lands.

Power alcohol from farm products: Its chemistry, engineering, and economics, G. Shepherd, W. K. McPherson, L. T. Brown, and R. M. Hixon (*Contrib. Iowa Corn Res. Inst. [Iowa Sta.], 1 (1940), No. 3, pp. [1]+283-375, figs. 17*).—In nontechnical terms this bulletin summarizes the chemistry of

gasoline as obtained by direct distillation and by cracking and polymerization processes; the engineering aspects of gasoline motor fuels; manufacturing processes for ethyl alcohol as made from various agricultural surpluses and wastes, including denaturation of the product for motor-fuel mixtures; economic considerations affecting the manufacture of fuel mixtures of alcohol with gasoline, with and without the further addition of tetraethyl lead; present and future problems, with which is included some discussion of petroleum conservation; and corn as an important raw material for alcohol manufacture. Four appendixes supplement the text discussion of some of these topics.

With corn at 50 ct. per bushel, alcohol may be made profitably for fuel blending purposes at approximately 25 ct. per gallon and can be used in proportions of from 5 to 12 percent with an increase in the price per gallon of between 0.7 and 1.2 ct. over gasoline given an equal antiknock value or "octane" rate by other antiknock agents. It somewhat increases the mileage per gallon and lowers the operating temperature of engines. It may be brought into future use by lowered cost of manufacture or by a necessity for petroleum conservation.

Tractor costs in Michigan, 1939, F. M. ATCHLEY (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, pp. 99-105, figs. 2).—Records kept by 56 Michigan farmers, operating 25 one-plow, 30 two-plow, and 5 three-plow tractors in 1939, included those of cash operating expenses, as well as the fixed charges for depreciation, interest, and shelter on the individual tractors, together with a record of the hours of use for all operations, including belt, drawbar, and custom work. Information on the acreage and production of the various crops, the number and production of the various kinds of livestock, and the receipts and expenses of operating each cooperator's farm was also obtained. Costs by size groups, sorts and quantities of fuel, hours of use by operations, hours of tractor use and tractor costs, and influence of size of farm are tabulated or shown in graphic form and are discussed.

Details of construction for a truck excavator, D. A. ISLER (*U. S. Dept. Agr., Soil Conserv. Serv.*, 1939, *SCS-TP-28*, pp. [2]+8+[6], pls. 8).—This publication gives constructional detail, working drawings, and bill of materials for an attachment to be mounted on a truck 1.5-ton or larger. This type of excavator eliminates hand dumping and hand return of the scrapers, the machine is easily moved from one job to another, and the construction is neither costly nor complicated. The machine is designed primarily for maintenance work and works to best advantage where the bottom width does not exceed 3 ft., the depth 6 ft., nor the quantity excavated from 40 to 45 cu. yd. per 100 ft. of length.

A small practical vinegar generator: A vinegar generator suitable for the farm or small manufacturer, F. W. FABIAN (*Michigan Sta. Cir.* 174 (1940), pp. 13, figs. 3).—The generator described consists essentially of (1) a base made from a glazed T-tile filled with cement-sand concrete (1:2) to 0.5 in. below the central opening and with paraffin over the concrete flush with the opening and (2) the generator tower proper made from three lengths of plain glazed tile jointed first with paraffin sufficient to prevent attack of the vinegar upon the concrete and above the paraffin with concrete to strengthen the joints. The outlet is fitted with a paraffined wooden disk having an outlet opening for the vinegar at the bottom and two air inlets above. The tower filling used in the experiments here described was of beech shavings, sifted to remove the finer pieces and loosely packed to allow abundant air space. A distributing trough of two compartments dumping alternately was made from tin plate and covered with paraffin to prevent corrosion, and is considered necessary to provide for even distribution of the cider over the shavings.

A paraffin-coated funnel set over the top of the generator reduced loss by evaporation. The shavings were kept in place by top and bottom plates of paraffined wood provided with numerous 0.25-in. holes. A bill of materials for generators made from 6- and 8-in. tile is given, together with a tabulation of estimated costs of construction, indicating that the 6-in. generator can be made for less than \$7 and the 8-in. generator for between \$8 and \$9. It is pointed out that these generators are adapted for from 5 to 50 bbl. of cider and are not practical for either larger or smaller quantities.

The processes of charging the filling material (shavings or corncobs, the former being preferred if suitable shavings are available) with *Acetobacter aceti* and operating the generator are described, and comparative observations on the performances of the two sizes of the generator are reported upon. In all experiments the 8-in. generator produced a much more rapid conversion, the vinegar reaching the same strength in several trials in one-third of the time required by the 6-in. generator. The 8-in. generator made 4 percent or standard vinegar in 2 days from cider cut back 50 percent with finished vinegar. It also produced a vinegar of 5.8 percent strength in a little more than 3 weeks from unmodified cider stock. The method of cutting back with finished vinegar is recommended because of the much shorter time required for complete conversion.

Operation of orchard heaters, R. A. KEPNER (*California Sta. Bul.* 643 (1940), pp. 32, figs. 15).—Observations and experiences in the operation of heaters are reported.

The smoke nuisance was minimized by keeping burning rates within the proper range for the type of heater used, by cleaning stacks and covers regularly and after each 20 to 30 hr. of burning at the least, by the use of tight-fitting covers kept tight by careful handling, and by regulating the heaters as soon as possible after lighting, with frequent inspection to keep them properly regulated. Difficulties due to residues in the bowl-type heaters were reduced by emptying the bowls after each 50 to 75 hr. of burning either by dumping the residual oil or burning it out, by preventing soot from falling into the bowls during the cleaning of stacks and covers, and by keeping residual oil separate from fresh oil. Automatic draft regulators were found superior to the ordinary regulator in control of the burning rate. A heater especially designed for burning residual or pour-back oil was devised, together with a heater so designed as to return part of the hot stack gases to the bowl and thereby to improve completeness of combustion. Coke heaters are considered advantageous where temperatures are relatively steady when firing is necessary, but impractical under conditions of large and frequent temperature fluctuations. A combined installation, the oil heaters for small heat demands and the coke heaters, or both oil and coke, for more severe conditions, is suggested. The chief advantages of coke heaters are lower investment costs and the elimination of the smoke nuisance.

Range, pasture, and field fencing: Recommended procedure, T. B. CHAMBERS (*U. S. Dept. Agr., Soil Conserv. Serv., 1939, SCS-EP-17, pp. 10, pls. 5*).—This condensed guide was prepared to aid in securing uniformity of practice, economy, effectiveness in the construction of the hundreds of miles of fencing required by the soil conservation program on purchased land and in the carrying out of conservation practice on numerous farms. Emphasis is placed especially on the selection of suitable types of fence, the materials required, and the more important methods of construction. Gates and cattle guards are also considered, and some working drawings for their construction are appended.

AGRICULTURAL ECONOMICS

Economics with applications to agriculture, E. F. DUMMEYER and R. B. HEFLEBOWER (*New York and London: McGraw-Hill Book Co., 1940, 2. ed., pp. XII+752, figs. 63*).—In this second edition (E. S. R., 72, p. 401) the changes in economic institutions and economic thought since 1934 have been incorporated; a number of chapters have been rewritten, and the statistical tables and charts are revised to include the latest available data. "The chapters describing such institutions as the money and banking system and agricultural credit and the relations of government to agriculture and to business have been largely recast in order not only to bring them up to date but also to integrate effectively recent and earlier developments. . . . Among the recent contributions to economic theory which have been included are those relating to the individual firm approach in price analysis and to monopolistic competition, money, and the business cycle."

[**Papers on agricultural economics**] (*Jour. Farm Econ.*, 22 (1940), No. 4, pp. 673-761).—Included are the following papers: Price Analyses, Wars, and Depressions, by M. Ezekiel (pp. 673-679) and War-Time Price Control in the United Kingdom, by J. H. Richter-Altschaffer (pp. 680-690) (both U. S. D. A.); Democratic Telesis and County Agricultural Planning, by B. Ryan (pp. 691-700) (Iowa State Col.); Crop-Yield Index Numbers, by E. J. Working (pp. 701-713) (Univ. Ill.); The British Program for Farm Labor—as a Contribution to American Thinking on the Subject, by M. R. Benedict (pp. 714-728) (Univ. Calif.); Contributions of Soil Science and Agronomy to Rural Land Classification, by C. E. Kellogg (pp. 729-739) (U. S. D. A.); Contribution of Cooperation to the Problem of Distribution, by W. E. Paulson (pp. 740-752) (Tex. Expt. Sta.); and Procedures which Increase the Usefulness of Farm Management Research, by W. D. Goodsell, R. J. Jessen, and W. W. Wilcox (pp. 753-761) (Iowa Sta. coop. U. S. D. A.).

[**Investigations in agricultural economics by the Arkansas Station, 1939-40**] (*Arkansas Sta. Bul.* 405 (1940), pp. 10-12).—Included are (1) brief findings by J. L. Chariton in a study of seasonal employment of nonresident labor as to number of migratory workers, earnings, income per family, and educational attainment of children, and (2) a discussion of the possibilities of adjustments through land use based on facts obtained in Hempstead County in cooperation with the U. S. Department of Agriculture

[**Investigations in agricultural economics by the Colorado Station, 1939-40**] (*Colorado Sta. Rpt.* 1940, pp. 46-48).—Brief statements are included as to the net returns per head for lambs fed in northern Colorado in 1938-39 as compared with 1937-38 and the average for 17 yr., and as to the average cash farm receipts on 155 rehabilitation units of the Farm Security Administration in 1937 as compared with those on 294 units in 1938.

Current Farm Economics, [December 1940] (*Oklahoma Sta., Cur. Farm Econ.*, 13 (1940), No. 6, pp. 139-170, fig. 1).—Included, in addition to a discussion of the agricultural outlook for 1941, by the staff of the department of agricultural economics, extension economists, and commodity specialists of the station and extension division and the usual tables of indexes of prices, purchasing power of Oklahoma farm products, etc., are articles on (1) Agricultural Conservation in Okfuskee County, by D. L. W. Anker (pp. 156-161) (coop. U. S. D. A.), including tables showing for 1939 the size of farm and participation in soil building practices, tenure of operators and participation and relationship between soil building practices and size of farm and tenure of operators, and (2) Is Storage of Wheat Profitable to the Oklahoma Farmer, by A. I. Larson (pp. 162-166). This article includes tables by years for 1921-39 showing

the gains and losses to the following September, December, March, June, and July from storing wheat in June and July. It did not appear profitable to hold wheat regularly after storage price was 1 ct. per bushel per month. Possibilities for loss were greater for wheat stored in June than that stored in July. The possibilities of loss in both cases were greater where the storage period averaged 1 yr. in length.

[Investigations in agricultural economics by the Wisconsin Station, 1939-40]. (Partly coop. U. S. D. A.). (*Wisconsin Sta. Bul.* 450 (1940), pp. 49-63, figs. 5).—Included are brief general statements regarding (1) the possibility of higher incomes from the adoption of a soil conserving cropping system as shown by a study made by H. O. Anderson, D. M. Keyes, and P. E. McNall; (2) the effect of efficient feeding on dairy incomes on 100 farms in Emmet Township studied by D. R. Mitchell; (3) the effect of size of down payment on the success of farm purchasers as shown by a study by McNall in a township in the northern part of the State; (4) the assets of tenants available for purchasing farms as shown by a study by McNall of 28 tenants who have operated the same farm for one year or more; (5) relation of size and condition of buildings to quality of soil of farm as shown by a study made by McNall, Mitchell, and E. J. Graul; (6) the proportion of farm families in rural areas of northern Wisconsin that can be classed as real farmers and the social and economic problems of different groups as shown by a study by G. W. Hill, R. A. Smith, and J. H. Kolb; (7) data as to prices of clover seed and the factors affecting such prices, by F. V. Beck and W. H. Ebling; (8) the returns from canning peas and the factors affecting such returns, by H. H. Bakken and M. Beal; (9) the preference of consumers for natural American cheese packed in small packages v. bulk cheese as shown by data obtained from 959 Madison housewives in a study by M. A. Schaars, A. Hobson, and collaborators; (10) data as to the number of food locker plants in the State, the location, size, rental, other charges, etc., obtained in a survey by Schaars in cooperation with the U. S. D. A. Farm Credit Administration; and (11) the effects of city expenditures on taxes of farmers in the rural-urban fringe area as shown by a study of Blooming Grove Township adjacent to Madison, by G. S. Wehrwein, S. Keyes, and assistants.

State summary of "annual farm success factor reports" on 1,346 Michigan farms, 1939, H. A. BERG, C. O. MAY, and J. C. DONETH (*Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, pp. 74-84, figs. 6).—Tables and charts are included and discussed showing (1) for 1939 the average farm earnings, the distribution of individual labor incomes by groups and by items, the average farm investments, farm receipts, and farm expenditures, and (2) by years 1929-39, the financial returns on farm-account farms, the percentage distribution by income groups of labor incomes, and the relationship between the ratio of Michigan farm prices to farm costs and labor incomes. Other tables show for the 1,346 farms studied in 1939 for the State and the 17 type-of-farming areas the average financial summary and crop and livestock figures, the percentages of land in different crops and crop yields, the kinds, amounts, and returns from livestock, and labor, machinery, improvement, and other costs.

Summary of returns on 17 identical farms in the Coastal Plain area of North Carolina 1928, 1930, 1934, and 1937, R. E. L. GREENE (*North Carolina Sta., AE-RS Inform. Ser. No. 7* (1940), pp. [1]+10, figs. 2).—Tables and charts show by years the average investment, utilization of land, acreages of different crops, numbers of livestock, receipts, and expenditures.

Some costs and results of a soil and moisture conservation program in western Pennsylvania, D. H. WALTER (Coop. U. S. D. A.). (*Pennsylvania Sta., Jour. Ser. Paper* 992 (1940), pp. [2]+38, figs. 3).—This paper is based on

survey data for the years 1934, 1936, and 1938 regarding the farms of 48 cooperating and 58 noncooperating farmers in the Crooked Creek watershed of Indiana and Armstrong Counties, which area was designated as a Federal erosion control project by the U. S. D. A. Soil Conservation Service in 1934. The area and farms studied are described. The soil conservation program; its implications as to land use, fertility practices, yields, and utilization of crops; food, livestock, and milk production; receipts, expenses, and labor income, etc.; and the attitude of farmers toward the program are discussed.

Farm management aspects of soil conservation on flue-cured tobacco farms in Virginia, W. L. GIBSON, JR. (Coop. U. S. D. A.). (*Virginia Sta. Bul.* 327 (1940), pp. 24, fig. 1).—This is a summary of the findings applicable to soil conservation reported in greater detail in Technical Bulletin 66 (U. S. R., 84, p. 258). It is based chiefly on studies made in 1933 and 1936 in Pittsylvania County in which the Banister River Watershed is a demonstration area of the U. S. D. A. Soil Conservation Service. Included are a description of the area, a general business analysis of the farms, and discussions of changes in farm practices related to soil conservation, the effects of erosion on the tobacco enterprise, and the effects of the Soil Conservation Service program on the operation of the farm business.

Rural assessment, with special reference to forests, A. Z. NELSON (*U. S. Dept. Agr., Forest Serv.*, 1940, pp. [1]+29).—This bibliography includes general items on forest land taxation and valuation, the theory of land and property appraisals, and general assessment practices and techniques, and references by States including assessment manuals and other published instructions, studies of property tax administration, and State tax law compilations.

American cooperation, 1940 (*Washington, D. C.: Amer. Inst. Coop.*, [1940], pp. XXII+785, figs. 7).—Included are the papers presented at the 1940 summer session of the American Institute of Cooperation, at East Lansing, Mich., on cooperation at work in America, cooperation in democracy today, war's effect on American life and agriculture, Government functions as they affect agriculture and cooperation, operating principles and practices of cooperatives, membership relations of cooperatives, education in cooperation, cooperative purchasing of farm supplies, cooperative marketing of fluid milk and of manufactured dairy products, cooperative marketing of poultry and eggs, cooperative marketing of livestock and wool, problems of farmers' elevators, cooperative marketing of potatoes, cooperation among sugar beet growers, and cooperative marketing and canning of fruits and vegetables.

Cooperative purchasing of farm supplies in West Virginia, M. A. ABRAHAMSEN (*West Virginia Sta. Bul.* 297 (1940), pp. 76, figs. 9).—Data were obtained regarding "(1) the historical development of purchasing associations; (2) agricultural and general economic conditions influencing the development of and the possibilities in cooperative purchasing; (3) organization features giving special consideration to problems of membership, management and control, and financial structure; (4) operating set-up paying particular attention to facilities, personnel, purchasing policy and methods, sales policy, side line activities, and accounting and auditing procedure; and (5) operating efficiency as indicated by available balance sheets and operating statements." The influence of agricultural development on cooperative purchasing in the State and the historical development of such cooperation are described. The analysis deals chiefly with Cooperative Farm Services, which name was assumed by the West Virginia Farm Bureau Service Company upon its reorganization in 1928. The organization features of Cooperative Farm Services are discussed in sections on membership relations, management and control, and financial structure. Its

operating set-up is discussed in sections on method of operation, purchasing policy, sales policy, and side line activities and accounting procedure, and its operating and financial condition in sections on sales and commissions, operating efficiency, and financial condition. Local warehouse operations are discussed in sections on operating practices, financial condition, service store operations of the Southern States Cooperative, Inc., and observations on local warehouse operations. The changes contemplated in the proposed reorganization of Cooperative Farm Services are discussed in the different sections and in the conclusions based on the study. Suggestions and recommendations for improvement in its organization are discussed in sections on historical, social, and economic background, the advisability of separating business control of Cooperative Farm Services from the West Virginia Farm Bureau, operating set-up, operating practices, and financial policies.

North Carolina cotton prices and local marketing practices, G. R. SMITH (*North Carolina Sta. Tech. Bul. 64* (1940), pp. 75, figs. 12).—Data were obtained from 36 local buyers in the Piedmont area of the State, 99 buyers in the Coastal Plain area, and 14 buyers in the Flatwoods area. Information as to marketing practices was obtained from 252, 321, and 50 cotton growers in the respective areas. Production v. consumption of cotton in North Carolina, trend in average length of staple and price relationships, premiums and discounts for individual bale sales, relationship between average price and average quality, variations in price between local markets, monthly variations in price, size of lots and prices received, and types of local markets and marketing practices of growers are analyzed and discussed. Some of the findings were: The number of bales of North Carolina cotton spun by spinners of the State exceeds production in the State by more than two to one. The cost of transporting cotton from surplus States to North Carolina mill points is generally 0.75 ct. or more per pound and the price paid growers for a given class of cotton is usually higher in North Carolina than in States farther from the southeastern textile center. The average price is somewhat higher in the local markets where the cotton is better than the average grade and longer in staple. Lots of more than one bale generally sell at slightly higher prices for a given grade and staple than do individual bale lots. The major portions of the cotton in the Piedmont and Flatwoods areas are sold to the ginner. In the Coastal Plain area local cotton merchants and representatives of central cotton merchants purchase about one-third of the cotton sold in the local markets. In the Coastal Plain and Flatwoods areas a majority of the local buyers grant production credit to some farmers. In the Piedmont area only one-sixth of the local buyers grant such credit. The percentages of cotton sold in single bale lots were less than 8 in the Coastal Plain area, 39 in the Piedmont area, and 27 in the Flatwoods area. Factors found to influence the time of selling were the necessity of meeting immediate obligations and the belief that the price had reached the most favorable level. Approximately 25 percent of the growers in the Piedmont area, 29 percent in the Flatwoods area, and 65 percent in the Coastal Plain area interviewed more than one buyer before selling. The number of bales of cotton purchased by local buyers varied from less than 50 to over 6,000 bales. Approximately 86 percent of the local buyers in the Flatwoods area, 40 percent in the Coastal Plain area, and 42 percent in the Piedmont area purchased less than 500 bales. Approximately 70 percent of the cotton is sold on standard description, with 34 percent classed by the take-up man of the firm purchasing and 36 percent classified after the cotton is received by the second buyers. Approximately 61 percent of the cotton purchased by local buyers is resold within 3 days. Local buyers deliver the major portion of their cotton to the second buyers by truck. Over 41 percent of the cotton purchased by local buyers is sold direct to the mills.

South Brazil: New land of cotton, O. W. HERRMANN (*U. S. Dept. Agr., Farm Credit Admin. Cir. C-117* (1940), pp. [4]+47, figs. 47).—The geographic and population pattern and the trends in production and exports of cotton in south Brazil are described. The cotton improvement program and the cotton marketing practices in the State of São Paulo are discussed. Attention is called to some things United States cotton growers can learn from Brazil.

The world wheat situation, 1939-40: A review of the crop year, J. S. DAVIS (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 17* (1940), No. 4, pp. [2]+145-220, figs. 19).—In 1939-40, with carry-over and crop each the second largest in history, wheat supplies for the world ex-Russia surpassed the high record set in 1933-39, with stocks heavily concentrated in North America, Australia, and Europe. The war which broke out in September 1939 profoundly influenced the season's wheat developments. The volume of international trade in wheat and flour surprisingly exceeded 600 million bushels. European countries, eager to maintain consumption and build up reserves, imported heavily despite marked advances in ocean freights, insurance rates, and c. i. f. prices. From very low levels in August 1939, wheat prices rose sharply in early September and advanced further in December on bullish crop news. In mid-May, responding to startling changes in war prospects, prices collapsed. Favorable crop progress further weakened United States prices thereafter, while price controls checked declines in Canada and Australia. Wheat consumption was generally well maintained in spite of wartime regulations and destruction.

World wheat survey and outlook, January 1941, H. C. FARNSWORTH and B. M. JENSEN (*Wheat Studies, Food Res. Inst. [Stanford Univ.], 17* (1941), No. 5, pp. [2]+221-260, fig. 7).—Continuing the series (*E. S. R.*, 84, p. 542), world wheat supplies for 1940-41 are of record size and concentrated heavily in overseas exporting countries. In Canada and Argentina, embarrassing surpluses present serious problems of storage in the face of wartime barriers to exports. In continental Europe ex-Russia, wheat supplies are moderately light, unevenly distributed, and partly withheld from consumption by governmental agencies and by farmers. World wheat exports in August-December were lower than in any preceding year of the present century, with the possible exception of 1917-18. Australian and Argentine exports were well maintained; but clearances from North America were strikingly small, especially as compared with the record heavy supplies there. Continental European imports, particularly into the Axis-dominated area, were notably low.

Charts and tables relating to the small fruit industry in New Hampshire, L. A. DOUGHERTY (*New Hampshire Sta. Bul. 321* (1940), *Ref. Sup.*, pp. [39], figs. 13).—Charts and tables supplementary to Bulletin 321 (*E. S. R.*, 84, p. 263) are included covering varieties, yields, production, sales, prices, returns, etc., of strawberries, red raspberries, blackberries, grapes, and the berry industry as a whole in the State.

A preliminary report of the cost of milk production on 53 dairy farms in four areas of Pennsylvania, 1939, W. L. BARR (*Pennsylvania Sta., Jour. Ser. Paper 987* (1940), pp. [1]+7, figs. 2).—This report is based on data from 53 farms, with 861 dairy cows, continuing previous work (*E. S. R.*, 82, p. 406).

Report of the Chief of the Agricultural Marketing Service, 1940, C. W. KITCHEN (*U. S. Dept. Agr., Agr. Market. Serv. Rpt.*, 1940, pp. 45).—The work of the Service during the year ended June 30, 1940, is discussed in sections on agricultural statistics; market news; standards for farm products; inspection, classification, and grading; regulatory work; and marketing research. The marketing research (pp. 41-45) is briefly described, and some findings are

given under the headings of cotton-marketing studies, toward better cotton ginning, spinning tests to determine quality, wool-shrinkage research, and the New York market study.

Report of the Chief of the Commodity Exchange Administration, 1940, J. M. MEHL (*U. S. Dept. Agr., Commod. Exch. Admin. Rpt., 1940, pp. 48*).—This report for the fiscal year ended June 30, 1940, summarizes the year's trading in commodities supervised by the Administration and discusses the future trading—volume, visible supply of the commodity, prices, deliveries, special accounts, etc.—in grain, cotton, wool tops, butter, eggs, potatoes, and millfeeds. The regulatory activities of the Administration are also discussed.

Report of the Director of the Office of Foreign Agricultural Relations, L. A. WHEELER (*U. S. Dept. Agr., Off. Foreign Agr. Relat. Rpt., 1940, pp. 14, fig. 1*).—This report for the fiscal year ended June 30, 1940, discusses the European war and American agriculture and inter-American relations in agriculture, and describes the organization and work of the major divisions of the office.

Wartime agricultural surpluses of the Danube Basin, F. STRAUSS (*U. S. Dept. Agr., Off. Foreign Agr. Relat., Foreign Agr., 4 (1940), No. 12, pp. 705-778*).—The role of the Danube Basin before and during the present war, the European needs for farm products, and the Danube Basin surpluses are described. The agricultural structure, pattern of agricultural production, agricultural export trade, and potential farm surpluses during and after 1940-41 of Rumania, Hungary, Yugoslavia, and Bulgaria are discussed.

Crops and Markets, [November 1940] (*U. S. Dept. Agr., Crops and Markets, 17 (1940), No. 11, pp. 233-256, figs. 3*).—Included are crop and market reports of the usual types. Those on crops include reports on the cattle feeding situation, November 1; cotton report, November 1; employment on farms, November 1; lamb feeding situation, November 1; prices received by farmers; stocks of wheat in interior mills, elevators, and warehouses, October 1; wage rates for picking seed cotton; and yield and production estimates as of November 1 for different crops, with comparisons with 1939 and the averages for 1929-38.

Agricultural statistics, 1940 (*U. S. Dept. Agr., 1940, pp. [1]+737*).—This volume continues the series (*E. S. R., 82, p. 412*) and includes statistics prepared under the direction of the Yearbook Statistical Committee on grains, cotton, sugar, tobacco, fruits, vegetables, tree nuts, beef cattle, hogs, sheep, horses, mules, miscellaneous crops, dairy cattle, dairy products, poultry, poultry products, foreign trade in agricultural products, farm business and related subjects, and miscellaneous subjects—forestry, weather, roads, etc.

RURAL SOCIOLOGY

Farmers in a changing world: Yearbook of Agriculture, 1940 (*U. S. Dept. Agr. Yearbook 1940, pp. XII+1215, figs. 100*).—The 54 articles included in the Yearbook of the Department are grouped into 7 parts, as follows:

Part 1, *The Farmer's Changing World*—*The Farmer's Changing World*, by F. F. Elliott (pp. 103-110); *Old Ideals Versus New Ideas in Farm Life*, by P. H. Johnstone (pp. 111-170); *American Agriculture—The First 300 Years*, by E. E. Edwards (pp. 171-276); *Agriculture in the World War Period*, by A. B. Genung (pp. 277-296); and *The Development of Agricultural Policy Since the End of the World War*, by C. C. Davis (pp. 297-326). Part 2, *Agriculture and the National Welfare*—*Agricultural Surpluses and Nutritional Deficits*, by J. P. Cavin, H. K. Stiebeling, and M. Farioletti (pp. 329-341); *The Farmer's Stake in Greater Industrial Production*, by L. H. Bean (pp. 342-365); and *The City Man's*

Stake in the Land, by A. P. Chew (pp. 366-382). Part 3, The Farmer's Problems Today and the Efforts to Solve Them—Agriculture Today, an Appraisal of the Agricultural Problem, by O. V. Wells (pp. 385-397); Our Major Land Use Problems and Suggested Lines of Action, by L. C. Gray (pp. 398-415); The Challenge of Conservation, by B. W. Allin and E. A. Foster (pp. 416-428); Our Soil Can Be Saved, by H. H. Bennett (pp. 429-440); The New Range Outlook, by W. R. Chapline, F. G. Renner, and B. Price (pp. 441-457); Forest-Resource Conservation, by R. E. Marsh and W. H. Gibbons (pp. 458-488); Farm-Management Problems in an Era of Change, by S. E. Johnson (pp. 489-508); The Influence of Technical Progress on Agricultural Production, by R. S. Kifer, B. H. Hurt, and A. A. Thornbrough (pp. 509-532); The Place of Forests in the Farm Economy, by B. P. Kirkland (pp. 533-550); Acreage Allotments, Marketing Quotas, and Commodity Loans as Means of Agricultural Adjustment, by J. B. Hutson (pp. 551-565); The Meaning of Foreign Trade for Agriculture, by A. P. Chew (pp. 566-584); Reciprocal Trade Agreements—A New Method of Tariff Making, by L. A. Wheeler (pp. 585-593); Methods of Increasing Agricultural Exports, by H. B. Boyd (pp. 596-605); The Industrial Market for Farm Products, by W. B. Van Arsdell (pp. 606-626); Reducing the Costs of Food Distribution, by A. C. Hoffman and F. V. Waugh (pp. 627-637); Marketing-Agreement Programs as a Means of Agricultural Adjustment, by B. A. Holt and D. M. Rubel (pp. 638-649); Thirty Million Customers for the Surplus, by M. Perkins (pp. 650-655); Barriers to Internal Trade in Farm Products, by E. L. Burtis and F. V. Waugh (pp. 656-666); Standardization and Inspection of Farm Products, by C. W. Kitchen (pp. 667-683); Cooperative Marketing by Farmers, by E. A. Stokdyk (pp. 684-705); The Growth of Farm-City Cooperative Associations, by S. N. Gubin (pp. 706-719); The Transportation Problem of Agriculture, by R. L. Dewey and J. C. Nelson (pp. 720-739); Agricultural Credit, by E. C. Johnson (pp. 740-754); Crop Insurance, by W. H. Rowe and L. K. Smith (pp. 755-770); Rural Taxation, by E. Englund (pp. 771-789); Rural Electrification, by R. T. Beall (pp. 790-809); New Conditions Demand New Opportunities, by R. C. Smith (pp. 810-826); The Rural People, by O. E. Baker and C. Taeuber (pp. 827-847); Patterns of Living of Farm Families, by D. Monroe (pp. 848-869); Overcrowded Farms, by W. W. Alexander (pp. 870-886); Farm Tenancy, by P. V. Maris (pp. 887-906); Farm Labor in an Era of Change, by W. T. Ham (pp. 907-921); and Beyond Economics, by M. L. Wilson (pp. 922-937). Part 4, Farm Organizations—Trends in National Farm Organizations, by D. C. Wing (pp. 941-979). Part 5, What Some Social Scientists Have to Say—Cultural Anthropology and Modern Agriculture, by R. Redfield and W. L. Warner (pp. 983-993); Democracy in Agriculture—Why and How? by R. Likert (pp. 994-1002); The Cultural Setting of American Agricultural Problems, by R. Turner (pp. 1003-1032); Education for Rural Life, by E. R. Embree (pp. 1033-1041); The Contribution of Sociology to Agriculture, by C. C. Taylor (pp. 1042-1055); and A Philosophy of Life for the American Farmer (and Others), by W. E. Hocking (pp. 1056-1071). Part 6, Democracy and Agricultural Policy—Public Information and the Preservation of Democracy, by A. D. Stedman (pp. 1075-1080); Science and Agricultural Policy, by T. S. Harding (pp. 1081-1110); Schools of Philosophy for Farmers, by C. F. Tausch (pp. 1111-1124); Old and New in Agricultural Organization, by M. S. Eisenhower and R. I. Kimmel (pp. 1125-1137); and Cooperative Land Use Planning—A New Development in Democracy, by E. A. Foster and H. A. Vogel (pp. 1138-1156). Part 7, Essentials of Agricultural Policy—Some Essentials of a Good Agricultural Policy, by H. R. Tolley (pp. 1159-1183). The articles are summarized by G. Hamblidge (pp. 1-100), and an appendix includes A Brief Chronology of American Agricultural History, compiled by D. C. Goodwin and P. H. Johnstone (pp. 1184-1196).

[Investigations in rural sociology by the Arkansas Station, 1940]. (Partly coop. U. S. D. A.). (*Arkansas Sta. Bul.* 405 (1940), pp. 4, 5, 8-10).—Data are presented showing displacement of families on cotton farms and on farmers moving to towns and cities, the latter by W. H. Metzler, and on factors affecting medical care in rural areas, by I. C. Wilson.

Proceedings of southern conference-seminar on teaching and research in rural sociology, Blue Ridge, N. C., August 26-30, 1940 (*South. Conf. Seminar, Teaching and Res. Rural Sociol., Blue Ridge, N. C., 1940, Proc.*, pp. [X]+196).—Included are the following papers (with discussions) on research: An Inventory and Critique of Rural Sociological Research Projects in the South During the Past Five Years. Including Current Projects in Progress, by B. O. Williams (pp. 70-119) (Clemson Agr. Col.); A Review of Some Recent Studies of Southern Culture, by C. P. Loomis (pp. 121-143), Charting Needed Areas of Rural Sociological Research in the South, by C. H. Hamilton (pp. 145-162), and Cooperation in Rural Sociological Research on an Interstate and Regional Basis, by C. C. Taylor (pp. 163-179) (all U. S. D. A.); and Selection and Recruitment of Personnel in Rural Sociology, by W. E. Gettys (pp. 181-196).

A survey in the social sciences: Men, groups, and the community, T. H. ROBINSON ET AL. (*New York and London: Harper & Bros.*, [1940], pp. XIX+965, [figs. 83]).—The perspective, some of the features of communities, social change, and problem situations are discussed, and ways and means of solving them are suggested.

Proposals for reorganization of the American Sociological Society, D. SANDERSON. (Cornell Univ.). (*Rural Sociol.*, 5 (1940), No. 3, pp. 345, 346).—The author reports on the proposals of the Organization Committee of the American Sociological Society, one of which is to the effect that the Rural Sociological Society, along with "other specialized societies," should have the privilege of affiliation. Affiliated societies are to be autonomous as to membership, finances, etc., but restricted to meeting at the same time and place as the American Sociological Society, and with coordination of programs.

Leadership for rural life, D. SANDERSON (*New York: Assoc. Press*, 1940, pp. 127).—This is an analysis of rural leadership from the viewpoints of the demand for leadership, manner of leadership, types of leaders, the group and the leader, the evolution of the leader in the group, developing and training leaders, the professional leader, and the meaning and values of leadership to the leader. Also included are a bibliography and an index and a foreword by M. L. Wilson.

Rural life in process, P. H. LANDIS (*New York and London: McGraw-Hill Book Co.*, 1940, pp. [XX]+599, [pls. 8, figs. 94]).—This book presents a view of rural life in a state of rapid transition. It is divided into five parts—the structure and organization of rural life in the United States, social experience and personality formation, interaction processes of a dynamic society, social institutions in a changing culture, and emerging problems of a dynamic society—comprising 20 chapters, an appendix, and author and subject indexes. In the appendix material is presented concerning the development of rural sociology in the United States.

A long-time experiment in local social planning, W. D. NICHOLLS. (Univ. Ky.). (*Rural Sociol.*, 5 (1940), No. 4, pp. 449-453).—The author reports a successful experiment in community improvement begun about 20 yr. ago in Fayette County, Ky. It is concluded that the project has culminated in the attainment of all the major goals of community improvement sought by its sponsors.

Cultural factors and land-use planning in Cuba Valley, New Mexico, K. OREGG. (U. S. D. A.). (*Rural Sociol.*, 5 (1940), No. 4, pp. 438-448, fig. 1).—"Cuba Valley is today inhabited by two distinct cultural groups, each with its

characteristic form of settlement and method of land use. The Spanish-American villages along the irrigable lands of the Rio Puerco represent a relatively long period of adjustment of people to a semiarid environment; the Anglo-American homesteads on the surrounding dry lands have some 20 yr. of recent history and represent a process of economic and cultural adjustment which is still in progress. Economic distress, especially among the Spanish-Americans, arises from the decrease in the physical resources of range and farm land, the contraction of the market for agricultural labor, and the natural increase in the population dependent upon these resources. The essential need of both cultural groups is for more land resources; the existing land resources are insufficient. A lessening of the intensity of their use is even desirable.

"In the light of these needs the Federal Government has initiated a land-use adjustment program in the area, placing its land-managing agencies in a position to determine the long-term trends in the use of resources. Some choice may have to be made as between the Spanish-American villages and the homesteaders. Before any choice can be made, however, it will be necessary to evaluate the possibilities of the development of a relatively stable community organization in the homestead area."

World wheat planning and economic planning in general, P. DE HERVEY (*London and New York: Oxford Univ. Press, 1940, pp. XIV+912, [figs. 8]*).—The author calls attention to the mutual interest of all countries in the solution of the wheat problem, and discusses both a proposal for an international wheat agreement and the economic, political, and social problems raised. Appended are more than 200 pages of tabular material and useful information pertaining to wheat.

Report of the Administrator of the Farm Security Administration, 1940, C. B. BALDWIN (*U. S. Dept. Agr., Farm Security Admin. Rpt., 1940, pp. V+24*).—The Administrator reports that the farm population is growing and that the rate of increase is highest in the poorest counties, mostly in the Appalachians, the Cotton Belt, the Lake States Cut-Over, the Great Plains States, and the Southwest, where, within 30 yr., assuming no migration and the present rate of population increase, the population of these poorer counties would double in number. Other problems confronting needy farmers are loss of soil, mechanization, and farm tenancy. More than 1,690,000 farm families had average incomes of less than \$500 a year, and nearly half of these had incomes of less than \$250 a year, including products raised for home use. In other words, about 4,000,000 people were subsisting on an average income of about \$1 a week. The rural standard of living was also shown to be very low by rural housing and health surveys. During the past 5 yr. the Administration has carried out a program of rehabilitation for needy farmers, has helped plan for a better standard of living, and has helped finance the farm and home plan. It is estimated that at least 80 per cent of all the money loaned will be repaid. The Administration has made loans for special purposes, such as water facilities and adjustment of farm debts, and endeavored to improve the tenure of farm tenants. It is also making land owners out of some farm tenants. It reports managing 184 homestead projects which were started by the Resettlement Administration, the Subsistence Homesteads Division of the U. S. Department of the Interior, and other prior agencies, and conducts migratory labor camps in Idaho, Oregon, Washington, California, Arizona, Texas, and Florida, where migratory problems are serious. In addition, the Administration is carrying on activities for the development of better rural housing, the encouragement of cooperatives, and the development of plans for medical care for low-income farm people.

Some characteristics of farmers on the Stillwater Creek watershed, O. D. DUNCAN and P. R. ROYER. (Okla. Expt. Sta. and U. S. D. A.). (*Southwest. Social Sci. Quart.*, 21 (1940), No. 3, pp. 234-245).—The data show that there is very little difference between cooperators and noncooperators with the soil conservation program in the Stillwater Creek watershed area of Oklahoma on the basis of the characteristics chosen. It may even be true that the soil conservation program itself may not operate selectively because of its conscious effort to appeal to all types of farm people. Education and plane of living seemed to be positively correlated with cooperation and to a significant degree.

They live on the land: Life in an open-country southern community, P. W. TERREY and V. M. SIMS (*University, Ala.: Univ. Ala., Bur. Ed. Res.*, [1940], pp. [XIV]+313, [figs. 20]).—This is a study of Upland Bend, an Alabama community. The origins, people, economic and civic life, health and medical services, homes, churches, schools, social and recreational activities, and leadership are discussed.

The South in progress, K. D. LUMPKIN (*New York: Internatl. Publishers*, [1940], pp. 256).—The author endeavors to diagnose the South and its social questions.

Comerio: A study of a Puerto Rican town, C. C. ROGEE (*Lawrence: Univ. Kans.*, 1940, pp. VI+198, [pls. 2]).—This is a presentation of information gathered by the author of the culture of the people of a Puerto Rican town.

Social aspects of land use in Delaware, R. O. BAUSMAN. (*Univ. Del.*). (*Jour. Farm Econ.*, 22 (1940), No. 3, pp. 637-640).—The author reports on the sociological aspects of land use in Delaware, including the influence of land use on the standard of living of farm families, on the age of farmers and the age at which they retire, and on the education of farm children.

Transmission of farming as an occupation, II, W. A. ANDERSON. (*Cornell Univ.*). (*Rural Sociol.*, 5 (1940), No. 3, pp. 349-351).—In a previous article (*E. S. R.*, 82, p. 844) the author presented a series of generalizations about the transmission of farming over three generations. "The present article supplements and tests whether these generalizations are true. It is based upon information obtained from 664 farm operators in Cortland County, N. Y., who furnished data about the occupations followed by their fathers, their brothers, and their sons. . . . These data show clearly that there is a decrease in the transfer of farming from fathers to sons in succeeding generations. In the previous study, 50 percent of the sons of the grandfathers and only 31 percent of the sons of the fathers became farmers." It is also shown that farming is an occupation that perpetuates itself and has little influx from other occupations. In the grandfather generation there were 148 families and in the father generation, 25, in which there were 2 or more sons, only one of whom followed the father's occupation of farming. The oldest son follows the father most frequently and then the youngest son. Both in the grandfather and the father generations, each major class of occupation was represented by sons.

Population trends in Colorado, R. W. ROSEKELLEY (*Colorado Sta. Bul.* 462 (1940), pp. 81, figs. 52).—This bulletin analyzes broad trends in Colorado's population make-up from the vantage point of historical perspective. It presents in pictorial and graphic form certain basic trends which occurred between 1860 and 1930, the statistical data being based almost entirely upon the Federal census.

The evidence indicates that the State is approaching a population saturation point under its present economic and social structure. Under present conditions of agriculture it is carrying about as many people as it can under

the standard of living. Additional people may have to be supported by mining or industry, or future increases in population may add to the relief burden already in existence or reduce the average numbers of hours of employment per person—reduce the standard of living.

Concepts of marginality in rural population studies, R. M. WILLIAMS. (Univ. Ky.). (*Rural Sociol.*, 5 (1940), No. 3, pp. 292–302).—"Current use of the concept of marginality with reference to farm populations raises certain problems of interpretation. Three types of marginality may be distinguished: Social welfare, cultural, and economic. Welfare marginality refers to a level of 'decent living' and therefore constitutes a value judgment defining a social problem. Cultural marginality arises at those points at which a population is confronted with instable, ambiguous, or conflicting norms for conduct. The economic margin may refer either to grades or to units of population and is conditioned upon social definitions of standards of living. The distinction between margin returns and average per capita returns is essential for clarity.

"The nature of the distribution of resources, rates of population growth, skills, and abilities affects per capita returns. Inequalities which raise returns in the short run may have unanticipated long-time results. Social structures and their supporting sentiments exert a significant influence upon mobility in response to economic conditions. Because of this, a social equilibrium is of a different order from, and does not necessarily correspond to, an economic equilibrium. Studies in rural sociology have made important contributions to the analysis of this problem; the outlook for further analytical research is promising."

Migration and rural population adjustment, C. TAEUBER. (U. S. D. A.). (*Rural Sociol.*, 5 (1940), No. 4, pp. 399–410).—"A mobile population is essential to the maintenance of an effective balance between population and resources in a nation characterized by marked differentials in rates of reproduction and in employment opportunities. Although migration from rural to urban areas was at a high rate during the 1920's, the unguided migration of that period did not evacuate rural problem areas on the scale which would be necessary to bring about desirable adjustments of resources and population. If this did not occur during a period when urban industry was calling for large numbers of rural workers, it was virtually impossible after 1930. Between 1930 and 1935 the increase in farm population was greatest in the poorest land areas—those in which considerations of a sound land use would call for a reduction rather than an increase in numbers."

Jewish agricultural colonization in Palestine: A sociological experiment in collectivism, J. W. ELATON. (Cornell Univ.). (*Rural Sociol.*, 5 (1940), No. 3, pp. 327–344).—"From every corner of the globe Jews are coming to Palestine to find liberty and security in their ancient homeland. Inspired by the ideals of Zionism, they have founded about 250 villages on lands that for hundreds of years had been barren deserts or malaria-ridden swamps. This Jewish agricultural colonization by city-bred traders and professionals constitutes a large-scale social experiment in collectivism. About a third of these Jewish colonies are collectives, with a communal household and without private property. Another third are cooperatives, with individual management of farms but cooperative buying and selling of goods. The rest are settlements of fully independent farmers. Together they offer an opportunity to study the possibility and problems of a collective society created by voluntary action without any governmental compulsion. They are an experiment in the establishment of a new democratic social system which attempts to more adequately adjust our society to its complex technology."

Men on the move, N. ANDERSON (*Chicago: Univ. Chicago Press, [1940], pp. XIII+357, [figs. 74]*).—In chapter 1 the passing of the "hobo" is noted. In the last chapter the author discusses work and welfare for migrants. The intervening chapters show the evolution of a class of migrant laborers. The author calls it journalistic sociology.

Part-time farming research, L. A. SALTER, JR., and L. F. DIEHL (U. S. D. A.). (*Jour. Farm Econ., 22 (1940), No. 3, pp. 581-600*).—The authors analyze 24 part-time farming research reports for the purposes of summarizing what has been learned about certain aspects of part-time farming and of aiding in the orientation of future research efforts in the field.

A sociological approach to farm tenancy research, O. D. DUNCAN. (Okla. A. and M. Col.). (*Rural Sociol., 5 (1940), No. 3, pp. 285-291*).—"The thesis of this paper is that farm tenancy is an attempted adaptation of land and other resources to human needs through definite socially sanctioned institutional channels. Thus far, however, sociological research in farm tenancy has been incidental for the most part. Hence, there is a need for more specific research on tenancy as a purely sociological phenomenon or as a pattern of social adjustment. The principal task of the paper is, therefore, to set up definite general propositions or hypotheses to be tested by research. In all, 15 propositions are posited which purport to cover, if not the entire sociology of farm tenancy, at least its major aspects."

Rural electrification: A field for social research, J. K. ROSE (U. S. D. A.). (*Rural Sociol., 5 (1940), No. 4, pp. 411-426, fig. 1*).—The author presents rural electrification as a dividing field for economic and social research. Nine questions are suggested for study, some economic, some sociological.

Some contrasts in white women employees in garment plants located in three types of communities of Mississippi, D. DICKINS. (Miss. Expt. Sta.). (*Rural Sociol., 5 (1940), No. 4, pp. 427-437*).—"Data concerning the women employed in garment plants of three communities, a village, a town, and a small city of Mississippi, are examined for the purpose of studying the feasibility of decentralization of industry in situations such as described. From the data presented, it would seem that decentralization of industries is feasible. The areas around the village plant had not yielded the maximum number of women anxious for work and with characteristics acceptable to industry. These included young women either single, widowed, divorced, or, if married, with no children or not more than one or two children, and women with some high school training. Women desiring to live at home reside within a reasonable distance of the plant on good roads and in a location where they could come with others or furnish transportation for others."

Dependent children in South Dakota, R. L. WOOLBERT and R. L. McNAMARA (*South Dakota Sta. Mimeog. Cir. 1a (1940), pp. [43]*).—A statistical supplement presenting the tables upon which Bulletin 332 was based (E. S. R., 83, p. 410).

FOODS—HUMAN NUTRITION

[**Studies on food preparation and utilization at the Colorado Station**] (*Colorado Sta. Rpt. 1940, pp. 27-30*).—Noted in this progress report is a continuation of the project on the cooking quality of eggs which dealt with the differences in eggs from individual hens, as shown by differences in deterioration rates, physical measurements, and performance when used in whole-egg sponge cakes and in custard. Progress is reported in a number of studies on the culinary quality of potatoes, including those dealing with cause and control of sloughing in pared boiled potatoes (E. S. R., 82, p. 847), the effect of fertilizer treatments on culinary

characteristics of Russet Burbank potatoes, and deep-fat frying tests with potatoes of several varieties. In a new project on pome and stone fruits, canning qualities of a number of freestone varieties of peaches were investigated and a number of cherry juice preparations and blends suitable for beverages and for jelly making were prepared.

[Foods and nutrition studies at the New York State Station] (*New York State Sta. Rpt. 1940*, pp. 12-15).—In addition to studies previously noted are discussions of the relation of yeasts to problems of food preservation and food quality, including investigations on kinds of containers suitable for packaging various types of food products. Vitamin A losses from freezing vegetables, the preparation of fruit flavors, and the production of superior wines from Concord and Niagara grapes are also discussed.

[Studies in foods and nutrition of the Montana Station], J. E. RICHARDSON (*Montana Sta. [Bien.] Rpt. 1939-40*, pp. 31, 32).—Brief summaries are given of a series of studies on methods of conserving the quality and food value of vegetables (E. S. R., 84, p. 122), and a progress report on the nutritional status of Montana college women with respect to vitamin C.

[Research in food and nutrition by the Wisconsin Station] (*Wisconsin Sta. Bul. 450 (1940)*, pp. 17-19, 26-29, 31-33).—Progress reports, some of which represent an extension of earlier work (E. S. R., 83, p. 126), are given of studies by H. Parsons and J. Wayne on paraffin sealing of kitchenette sauerkraut as an aid to preserving vitamin C and preventing brown discoloration (p. 17); by G. Everson and D. Hussemann in an attempt to find means of preventing progressive vitamin C destruction in canned tomatoes (p. 18); by Parsons and C. Walliker on the effectiveness of soaking prior to deep-fat frying in improving the quality of the protein in salted soybeans (pp. 18, 19); by S. B. Randle, H. A. Sober, C. A. Elvehjem, and El. B. Hart on the vitamin, found present in milk, that prevents stomach ulcers in guinea pigs and, in cooperation with J. Shaw and P. Phillips, on the precise nature of the symptoms involved (p. 26); by J. M. McKibbin and Elvehjem on the vitamins of the B complex needed for dogs (pp. 26, 27); by H. A. Waisman, L. M. Henderson, and Elvehjem on the destruction of vitamin B₆ in meats (p. 27); by T. W. Conger and Elvehjem on a method for assaying materials for vitamin B₆ (pp. 27, 28); by El. Nielson, J. J. Oleson, and Elvehjem on isolating the anti-gray hair vitamin in pure crystalline form (p. 28); by Waisman and Elvehjem on the multiple deficiencies of the Goldberger pellagra-producing diet (pp. 28, 29); by Waisman, Henderson, and Elvehjem in developing a chemical method for assaying foods for nicotinic acid (p. 29); by Oleson, R. Mills, and Elvehjem on the need of pantothenic acid to keep the adrenal glands of rats in good condition and to prevent development of the chick disease formerly called "chick pellagra" (p. 31); by F. M. Strong, R. El. Feeney, and A. Earle in working out a bacterial assay method for pantothenic acid (pp. 31, 32); by F. Quackenbush, F. Kummerow, and H. Steenbock in finding that white rats need linoleic acid (p. 32); by Steenbock, Parsons, and P. Glindeman in determining the conditions under which low-phosphorus diets produce kidney stones in animals (p. 33); and by El. Hove, Elvehjem, and Hart on the unfavorable effect of boron deficiency on reproduction and lactation (p. 33).

The effect of quick freezing on the nutritive values of foods, M. S. ROSE (*Jour. Amer. Med. Assoc.*, 114 (1940), No. 14, pp. 1356-1361).—This review, authorized for publication by the Council on Foods of the American Medical Association, deals with available evidence on the nutritive value of quick-frozen foods under the headings—types of process used in quick freezing, special problems in selection and preparation of foods for quick freezing, quick freezing reduces cooking time, nutritive values of quick-frozen foods, and effect on vitamin

A. vitamin B₁ (thiamin), vitamin G (riboflavin), and vitamin C (ascorbic acid) values.

Review of progress in research in bread staling, W. H. CATHCART (*Cereal Chem.* 17 (1940), No. 1, pp. 100-121, figs. 4).—This review summarizes the explanations that have been offered concerning what happens in the staling of bread, and discusses methods of measuring staleness and of preventing it. Present knowledge as to the nature of the staling process is inadequate, and further strictly controlled scientific researches are necessary to determine the nature of this process before looking for substances that will prevent it.

Some of the methods recommended for delaying crust staling increase crumb staling and vice versa. Crumb staling is most effectively delayed by heat or cold, although application of these processes is not entirely practical at the present time. On the basis of present data pertaining to staling of crust and crumb, it is suggested that a palatable loaf of good keeping qualities can probably be produced by observing the following precautions: "Using flour with high-quality gluten; using liberal amounts of milk, shortening, and sugar (preferably sirup); using normal amounts of salt and yeast; using some malt extract and some moisture-retaining agent such as gelatinized starch; making a medium slack dough by high-speed mixing; proper fermentation, handling, and baking; rapid cooling and wrapping after adequate cooling."

Foods and drugs, E. R. TOBEX (*Maine Sta. Off. Insp.* 175 (1940), pp. 135-254).—In this annual report (E. S. R., 82, p. 274) analyses are given for 3,662 samples of milk, 415 of cream, 20 of ice cream, 13 of maple sirup, and 71 and 5 of opened (shucked) clams and oysters, respectively. Results of examinations of various drugs, 89 samples of hamburg steak as to sulfite content, and 113 samples of canned sardines as to the nature of the packing oil are also reported.

To market, to market, M. T. GAMBLE and M. C. POSTER (*Indianapolis: Bobbs-Merrill Co.*, [1940], pp. 279, [figs. 72]).—This book, concerned not with food values but with the buying of foods, is nontechnical in character. It gives very general information, based upon the practical experience of the writers, concerning the various foods on the market shelves, the nature of these products being noted in some cases. Opinions concerning quality and buying guides are presented, chiefly through illustrative incidents involving the cast of characters rather than by factual information.

Feeding the family, M. S. ROSE (*New York: Macmillan Co.*, 1940, 4. ed., pp. XV+421, [pls. 17]).—This book, noted in earlier editions (E. S. R., 62, p. 686), has not been extensively changed in the present revision, the main purpose still being "to show how the use of suitable proportions of common foods—milk, cereals and breadstuffs, fruits and vegetables, fats, sugars, and meats—will provide all the healthy members of the family group with food for optimum nutrition." In the light of more recent knowledge as to the importance of diet for the mother during the periods in which the child is directly dependent upon her for its nourishment, increased emphasis has been placed upon the daily use of rich sources of vitamins and mineral elements at all times when growth is involved. More liberal use of milk and green vegetables in the diet of the adult is also emphasized. Progress in the recognition of allergy as a dietary problem has led to the inclusion of a section on allergy in the chapter on feeding the sick. The table on nutritive values of serving portions of individual foods (presented in the appendix) has been remade to include data on minerals and vitamins.

The composition of optimal and marginal diets, A. L. BACHARACH and J. C. DRUMMOND (*Chem. and Indus.*, 59 (1940), No. 3, pp. 37-40).—In this paper an optimal diet is defined as "one whose effect on health cannot be improved by any change in quantity or quality of the elements and compounds present," and

a marginal diet as "a diet that, if consumed for a considerable time—say 6 mo. or even a year—would not result in the appearance of any obvious conditions of deficiency and would not even bring about any untoward changes that could not be reversed by substitution of a diet nearer the optimal." Estimated requirements for the two types of diets are given for a man of 60-70 kg. body weight, with recognition of the necessity of making allowances for certain conditions in adapting the figures to other individuals. In order to avoid the difficulty of individual variations in requirements, the two dietary standards devised have been calculated to provide the upper and lower safety limits. The tabulated data on requirements indicate gaps in knowledge or uncertainty in requirements by interrogation points. The definite values given for "fuel, bricks, and mortar" for marginal and optimal diets, respectively, are animal fat 30 and 100 gm., vegetable fat 20 and 20, animal protein 30 and 50, vegetable protein 20 and 50, carbohydrate 570 and 485, and total weight 670 and 705 gm., furnishing 3,000 and 3,500 calories, respectively. Estimates given without question for mineral elements and vitamins are phosphorus 1.0 and 1.5 gm. for the marginal and optimal diets, respectively; calcium 0.75 and 1.5 gm.; iron 10 and 20 mg.; vitamin A or β -carotene 1 or 2 mg., totaling 3,000 International Units for the marginal and 3 and 5 mg., totaling 7,000 I. U. for the optimal diet; vitamin D (calciferol) 200 and 400 I. U.; aneurin or vitamin B₁ 1 mg.=350 I. U. and 3 mg.=1,000 I. U.; and ascorbic acid 25 mg.=500 I. U. and 75 mg.=1,500 I. U., respectively.

Adequate nutrition for the industrial worker, L. E. BOOHER. (U. S. D. A.). (*Jour. Amer. Med. Assoc.*, 114 (1940), No. 7, pp. 548-553).—This article, based, according to the citations, as to diet plans and food selections upon material presented in the U. S. D. A. Yearbook for 1939 (E. S. R., 82, p. 553), gives a general view of what constitutes sound nutritional policy and cites certain studies bearing particularly on the needs of the industrial worker; these latter are concerned primarily with the relation of diet to the relief of industrial fatigue.

Diet during lactation and pregnancy, E. C. HUGHES (*Med. Woman's Jour.*, 47 (1940), No. 1, pp. 19-24).—The metabolic changes occurring in each of the trimesters of pregnancy and in lactation are discussed as the basis for the diet recommendations given. A bibliography of 30 references is appended.

The estimation of the nutritional state in children, M. M. GLAZIER (*New England Jour. Med.*, 222 (1940), No. 5, pp. 180-184, figs. 5).—The subjects of this investigation consisted of 556 children from 2 to 12 yr. of age, including 287 attending the first four grades of a primary school and for the most part from families whose yearly income was from \$1,000 to \$2,000, and 269 representing consecutive cases from the outpatient department of the Boston Dispensary which gives medical services to a comparatively low-income section of the population. Observations on these children over a 5-yr. period were of two types classified as A, physiological aspects or functional symptoms, including appetite, activity, character of stools, sleep, and frequency of infection; and B, physical aspects, including family tendency or inheritance and physical development as shown by interval gains in weight and height and physical examination. Special emphasis was placed in this examination on the state of the soft tissues and skeletal structure and the presence of foci of infection. Analysis and coordination of the data obtained in A and B resulted in placing the subjects in three groups classified as good, fair, and poor nutrition. In the first group were included children ranked as good in both A and B, in the second those ranked as good in only A or B, and in the third those rating low in both A and B. At the beginning there were 332 cases in group 1, 151 in group 2, and 73 in group 3.

In a special study of 30 children whose state of nutrition changed during the years of observation, the first sign of improvement in children with mal-

nutrition was in their physiological state as shown by better appetite, more restful sleep, regular bowel movements, and a lessening or disappearance of fatigue. From several days to several weeks were required for reclassification as fair nutrition, and from 4 weeks to 8 mo. further for the development of physical signs denoting good nutrition. The reverse change from good to fair nutritional state required varying periods of time, depending on the degree of infection or the dietary deficiency. The first signs of regression were in the functional symptoms, followed by poor posture, poor tissue turgor, and other signs of malnutrition. The relationships between certain factors in A and B with reference to the three stages of nutrition are discussed and presented in graphs.

Individual growth records of two healthy girls from birth to maturity, H. GRAY and H. K. FABER (*Amer. Jour. Diseases Children*, 59 (1940), No. 2, pp. 255-280, figs. 4).—Two healthy girls of known racial-economic background, health, and age of puberty were observed at frequent intervals from birth to 17.3 and 18.2 yr. of age, respectively, as to height and weight (reported in this study) and anthropometric measurements. The weight series for each girl beyond the age of 13 yr. illustrated that a girl's weight may diverge markedly from the most suitable standard despite absence of disease, and may fluctuate markedly from month to month despite absence of dieting.

The food habits and physical condition of children in selected communities in Maine, M. M. CLAYTON (*Maine Sta. Bul.* 401 (1940), pp. [4]+154, figs. 17).—This is a detailed report of an examination of 677 grade school children in three towns in sections of the State where potato growing, fishing, and general farming predominated. The children in all three towns were studied in the fall of 1934 and spring of 1935 and in the potato-growing section in the fall of 1935 and spring of 1936 after educational work in health and home gardens had been carried on in the interim. The tests included physical examinations (by physicians), dental examinations (by a dentist or the State director of dental hygiene), physical measurements, and tests for vitamin C deficiency by the Dalldorf capillary resistance method and for vitamin A deficiency by the Jeans and Zentmire method.

The most outstanding nutrition and health problem was considered to be the need for improving the condition of the bones and teeth by providing more calcium and vitamin D. Another important problem appeared to be the need for more vitamin C, the lack of which was evident in the extent of inflamed gums and to some extent in the capillary resistance tests. Anemia was also quite common during the winter months. There was some evidence of improvement as a result of the educational work, particularly in the smaller differences between fall and spring readings in the second year.

"Efforts toward improving the nutritive condition of Maine people should be directed toward increasing food production and preservation by families and toward educating them to choose more adequate diets. Special attention should be given to the regular provision of vitamin D and calcium throughout the year, especially to women during pregnancy and lactation and to infants and children."

Protein requirement in adolescence and in middle age, I. HARRIS, J. T. IRELAND, and G. V. JAMES (*Lancet* [London], 1940, I, No. 5, pp. 220, 221).—Data are reported briefly on nitrogen balance studies on two normal young men and one middle-aged man normal except for a moderate rise in blood pressure often typical of this age. These cases and the findings are offered as illustrative of many such cases observed. The young men on a daily intake of approximately 23 gm. of nitrogen showed a negative or only a slightly positive balance, but the older man on a similar intake retained a large part of this nitrogen, some of which was accounted for in the increase in total blood nitrogen and some of which must have been stored in the tissues. Whereas the adolescent was capable

of metabolizing a large quantity of protein, the requirement of the middle-aged man was small. It is urged that these differences be taken into account under the rationing scheme.

Symposium on carbohydrate metabolism (*Endocrinology*, 26 (1940), No. 2, pp. 285-351, figs. 6).—In this symposium, sponsored by the American Physiological Society at Toronto, Canada, April 29, 1939, the following papers were presented: Glycogen Breakdown and Synthesis in Animal Tissues, by C. F. Cori (pp. 285-296); The Liver and Carbohydrate Metabolism, by S. Soskin (pp. 297-308); The Adrenal Cortex and Carbohydrate Metabolism, by C. N. H. Long, B. Katzin, and E. G. Fry (pp. 309-344); and The Pituitary Gland and Carbohydrate Metabolism, by F. C. Young (pp. 345-351).

Sucrose taste thresholds of rats and humans, C. P. RICHTER and K. H. CAMPBELL (*Amer. Jour. Physiol.*, 128 (1940), No. 2, pp. 291-297, figs. 2).—The technic employed with rats involved a preliminary adjustment of the animals which were kept at room temperature (75°-78°F.) in individual cages equipped with two graduated inverted drinking fountains filled with distilled water. After 10-15 days, when the intake from each bottle reached a fairly constant level, the sugar solution, increased in concentration daily in small steps from 0.01 to 1.60 percent, was substituted for water, always in the same bottle. The point at which the rats began to drink more sucrose solution and less distilled water was taken as the concentration at which they distinguished between the two. For the 13 rats studied, the difference was recognized at a sucrose concentration of 0.5 percent on an average, with a variation from 0.3 to 0.8 percent. This concentration apparently represented the sweet taste threshold of the rats.

In the experiments with human subjects the "choice" method used in an earlier study with salt solutions (E. S. R., 83, p. 129) was used. Forty-five young adults first recognized the difference between distilled water and sucrose solution in average concentrations of 0.17 percent and first recognized the sweet taste in average concentrations of 0.41 percent. Nineteen adults from the laboratory staff and clinic patients showed similar results. In 58 children the sugar taste threshold averaged 0.68 percent and in 52 elderly individuals 1.23 percent. From these studies it is concluded that rats and humans have nearly the same sucrose taste thresholds.

Effects of natural and refined sugars on oral lactobacilli and caries among primitive Eskimos, D. B. and L. M. WATGH (*Amer. Jour. Diseases Children*, 59 (1940), No. 3, pp. 483-489).—After a preliminary survey of Eskimos in three native settlements of the lower Kuskokwim River area of Alaska, the mouths and teeth of the cooperating subjects were examined. All caries and "catches" were recorded. Paraffin-stimulated saliva was cultured, and the findings concerning the presence of lactobacilli were recorded. Twenty-four of the subjects were observed over subsequent periods varying from 5½ to 10½ weeks, during which time they received refined sugar in the form of lump sugar, sugar solutions, candy, and very sweet preserved figs. Twenty subjects observed for 5½-13 weeks received sugar as it occurred naturally in such foods as raisins, dried figs, dates, maple sirup, and honey. At the end of the observation periods another check was made as to the occurrence of caries and the presence of lactobacilli in the saliva.

The results showed that practically 100 percent of those free from caries in the group fed the naturally occurring sugars remained free from caries and had a decrease in the percentage of lactobacilli. Of those with carious mouths in this group, 57.2 percent showed an increase in cavities, with an average increase of 1.57 cavities. Of those free from dental caries in the group fed refined sugars, 72.7 percent showed inception of caries, with an average of 3.6 cavities.

Of those with carious mouths in the group fed refined sugars, 100 percent showed an increase in cavities, with an average increase of 4.9 cavities. Of the subjects receiving refined sugar, 81.0 percent showed initiation of the growth of oral lactobacilli, and these organisms were present in 100 percent of the mouths at the end of the feeding period. It is considered from these results that refined sugars initiate and cause an increase in dental caries and in the growth of oral lactobacilli in the Eskimo.

Failure of galactose given subcutaneously to produce cataract in rats, R. M. SELLE (*Arch. Ophthalmol.*, 23 (1940), No. 2, pp. 369, 370).—In an effort to determine the exact manner by which galactose induces the formation of cataracts in rats, as first demonstrated by Mitchell and Dodge (*E. S. R.*, 74, p. 418) and confirmed by Yudkin and Arnold (*E. S. R.*, 74, p. 419) and by Day (*E. S. R.*, 77, p. 429), 10 young adult female rats averaging 160 gm. in weight were given daily for 120 days subcutaneous injections of 2 cc. of a 50 percent solution of galactose in an 0.85 percent solution of sodium chloride and an equal number 2 cc. of the same salt solution without galactose. None of the rats in either group developed cataract, but among the 124 young in 19 litters born to the 10 controls and 106 young in 17 litters born to the 10 animals receiving galactose, 1 litter of 2 in each group had defective eyes. In 3 of these 4 animals (all females) the defect was in the form of large bilateral cataracts. When sexually mature, these rats were bred to the 1 male in the same group. In the 3 litters produced all of the animals (2, 3, and 6) had normal lenses. In the second experiment 17 rats at the age of 21 days were given daily subcutaneous doses of 1 cc. of a 50 percent solution of galactose, again with negative results.

Diurnal variations in the acid-base balance, A. B. HASTINGS and C. W. EISELE (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 2, pp. 308-312, fig. 1).—This study involved determinations of percentage of cells, pH, and total CO_2 in samples of cutaneous blood collected at 2-hr. intervals (in two 24-hr. experiments) from a normal individual recovering from a minor surgical operation and at rest in bed. Bicarbonate concentration of the serum and CO_2 tension of the blood were calculated. Any trends toward net base excess or net acid excess were determined by estimating what the serum bicarbonate concentrations would have been at pH 7.40 (calculated as bicarbonate concentration of serum + 30 (pH - 7.40)). For this normal adult it was found that the acid-base balance of the blood varied in a regular, not a random, manner during the 24-hr. period due to (1) a rise in plasma HCO_3 associated with the ingestion of food and (2) an increase in the CO_2 tension of the blood associated with sleep.

Influence of organic acids, sugars, and sodium chloride upon strains of food poisoning staphylococci, T. D. NUNHEIMER and F. W. FABIAN. (*Mich. Expt. Sta.*). (*Amer. Jour. Pub. Health*, 30 (1940), No. 9, pp. 1040-1049, figs. 2; *abs. in Michigan Sta. Quart. Bul.*, 23 (1940), No. 2, pp. 111, 112).—Five viable pathogenic strains of staphylococci isolated from food poisoning outbreaks and the nonpathogenic strain of *Staphylococcus albus* were used in these tests in which growth-inhibiting and germicidal effects of the various chemical agents were determined by methods noted briefly. The antiseptic and germicidal effects of the highly dissociated mineral acid (HCl) appeared to be due mainly to the H-ion concentration, but with the organic acids studied these effects were apparently associated with the unionized molecule or the anion or both. "The decreasing order of germicidal action of the acids was found to be acetic, citric, lactic, malic, tartaric, hydrochloric. The decreasing order of antiseptic action was found to be acetic, lactic, citric, malic, tartaric, hydrochloric. . . . Dextrose

exerted an inhibitive effect in concentrations of 30 to 40 percent and a germicidal effect at 40 to 60 percent. Sucrose is less active than either dextrose or sodium chloride, since a concentration of 50 to 60 percent was required for inhibition and 60 to 70 percent for germicidal action." With mixtures of sugars and acid, dextrose was found to be more effective than sucrose in lower concentrations of acids. Neither of the sugars, however, was as efficient as sodium chloride in acid.

Mineral metabolism of rats on an extremely sodium-deficient diet, E. ORENT-KEILES and E. V. MCCOLLUM (*Jour. Biol. Chem.*, 133 (1940), No. 1, pp. 75-81).—The symptomatology of extreme sodium deficiency and its effect on reproduction in the rat were reported earlier.⁵ The present study continues with a report of the effect of such deficiency on the excretion of nitrogenous compounds, K, Ca, Mg, P, Na, and Cl. Balance determinations of these elements were made at 7-day intervals throughout the experimental period of over 19 weeks in which the behavior of three young rats placed at weaning on a diet containing 0.002 percent of Na was compared with that of three litter mate controls on a diet containing 0.66 percent of Na.

On an average the experimental and control animals, respectively, gained 57.7 and 97.5 gm. in weight over this period, consumed 435 and 452 gm. of food, and 1,074 and 1,720 cc. of water, and retained 760 and 2,095 mg. of N. Thus the Na-deficient animals failed to utilize protein as effectively as the controls and this, together with the lesser water retention and fat deposition, accounted for their smaller weight gains. There was a continuous negative Na balance totaling -41 mg. in the Na-deficient animals (+636 mg. in the controls). At the same time there was a slightly increased Mg retention (85 mg. as compared with 65 mg. in the controls) and a greatly increased K retention (310 mg. compared with 78 mg. in the controls). The Ca, P, and Cl metabolism, however, was similar in the two groups of animals.

The increase in Mg and K retention apparently compensated for the low Na retention, thereby maintaining the alkaline reserve of the body. The lowered water retention associated with a negative Na balance but a normal Cl retention indicated that Na rather than Cl is associated with water metabolism, and that the tissues do not retain water unless supplied with Na. Extreme pathological changes in the eye and the onset of rapid loss of weight occurred simultaneously with the change in the fourteenth week from a positive, although progressively decreasing, N balance to a negative N balance which remained negative to the end of the experiment.

The biochemical behavior of lead.—I, Influence of calcium, phosphorus, and vitamin D on lead in blood and bone, A. E. SOBEL, H. YUSKA, D. D. PETERS, and B. KRAMER (*Jour. Biol. Chem.*, 132 (1940), No. 1, pp. 239-265).—These experiments were designed to clarify the type of relationship existing between the deposition of Ca and Pb in young rats fed diets varying in Ca, P, and vitamin D but constant in Pb. The experimental diets were of three types, all with Pb at 0.8 percent but one being low in Ca (0.025 percent) and low in P (0.262 percent), another high in Ca (1.02 percent) and low in P (0.262 percent), and the third high in P (0.857 percent) and low in Ca (0.025 percent). Each diet was fed to two groups of animals, one of which received vitamin D (100 International Units by mouth per rat per day), while the other did not.

The influence of vitamin D and of dietary Ca and P on Pb deposition was followed through quantitative data obtained on Ca, P, and Pb of the serum, Pb of whole blood, and ash and Pb in the dried fat-free femurs. The results,

⁵ Amer. Jour. Physiol., 119 (1937), No. 3, pp. 651-661, figs. 6.

which are tabulated and discussed at length, show that Ca, P, and vitamin D all influence the biochemical behavior of Pb. Apparently Pb, P, and vitamin D form a system of Pb deposition analogous to the system of calcification; the addition of Ca tends to remove P from the system for Pb deposition. It is shown that Pb can be deposited in the bones simultaneously with the removal of Ca. and that increased calcification does not necessarily mean increased Pb deposition. This is taken as evidence that Pb deposition is not a coprecipitation with Ca phosphate, but is directed by a system of its own apparently governed by the same laws as for Ca deposition. The influence of Ca is competitive, since the Ca tends to remove P available for Pb deposition. As the dietary ratio of Pb:P is increased, the blood Pb increases, these relationships being similar to the ones in the Ca system; the effect of vitamin D additions on the Pb system is similar to the influence on the blood Ca.

Lead content of human blood, J. N. M. CHALMERS (*Lancet [London]*, 1940, I, No. 10, pp. 447-450).—The content of lead in blood, determined by the dithizone method of Tompsett (E. S. R., 84, p. 8), was studied in 70 people with no known industrial exposure to lead and in 44 lead workers who presented no clinical symptoms of lead poisoning, but 34 of whom showed a slight degree of stippling of the erythrocytes in blood films stained with methylene blue. In the former group the blood lead values varied from 30 to 89 $\mu\text{g.}$ and averaged 57 $\mu\text{g.}$ per 100 cc.; in the latter group the values ranged from 60 to 192 $\mu\text{g.}$ and averaged 104 $\mu\text{g.}$ per 100 cc. The raised concentrations of lead in the blood, like the presence of stippled cells in the blood films, indicated an increased absorption of lead. They were indicative of the degree of exposure, but bore no correlation to the length of exposure. It is considered that the diagnosis of lead poisoning is essentially clinical, but that the biochemical and hematological tests furnish useful information, particularly in the diagnosis of doubtful cases or as negative evidence.

Preliminary feeding experiments with thiourea (thiocarbamide), A. HARTZELL (*Contrib. Boyce Thompson Inst.*, 11 (1940), No. 4, pp. 249-260, figs. 2).—The use of thiourea to prevent browning of cut surfaces of fruits and some vegetables, in preparing fresh fruit salads and in the canning of various fruits or in their use in pie baking, prompted the present study, which appears to indicate its nontoxicity to guinea pigs, rats, and man. The results of feeding tests with dogs and mice by H. Molitor, incorporated in this paper, led to similar conclusions.

Feeding tests with thiourea (thiocarbamide), F. B. FLINN and J. M. GEARY (*Contrib. Boyce Thompson Inst.*, 11 (1940), No. 4, pp. 241-247).—The authors made tests on rabbits and rats, finding the toxic dose to be ± 10 gm. per kilogram of body weight of these animals, which would be ± 700 gm. of thiourea for a man weighing 70 kg. This is more than 100,000 times the amount that would be ingested in eating 200 gm. of fruit treated with thiourea.

Observations on the multiple nature of the "rat filtrate factor," D. W. WOOLLEY (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 2, pp. 352-354, fig. 1).—In a further study of the question of the identity of pantothenic acid with the rat filtrate factor (E. S. R., 83, p. 567), evidence is reported briefly, indicating that there are other unknown growth factors. Pantothenic acid was found to promote growth in filtrate factor-deficient rats for only a relatively short period, after which there was a dramatic response in growth to certain liver concentrates. Several sources of the unknown growth factor were compared, of which the fraction of aqueous liver extract soluble in 95 percent alcohol proved to be the richest source. One percent of this fraction added to the ration of rats which had ceased to grow after the addition of 100 γ per day

of pantothenic acid caused a weekly gain of 15 gm. A method is described for concentrating the unknown factor or factors in this extract.

Negative results are reported in attempts to substitute for this liver extract or the concentrate prepared from it a highly potent concentrate of biotin prepared by the method of Woolley, McDaniel, and Peterson (E. S. R., 82, p. 463).

Margarine, J. C. DRUMMOND (*Nature [London]*, 145 (1940), No. 3663, pp. 53-55).—The development of margarine manufacture is traced from its earliest production by *in vitro* digestion of beef fat to the present production of vitaminized margarine. The place of margarine in the nation's diet in time of war is discussed, with emphasis on the desirability of enriching all margarines with vitamins A and D. It is estimated that a weekly supplement to the butter ration of Great Britain at the time of this writing (slightly less than 4.5 oz. weekly), of 6 oz. of reinforced margarine would add about 2,700 units of vitamin A and 180 units of vitamin D to the weekly diet.

The vitamin A content of the livers of Chinese infants, children, and adults, T. T. WOO and F. T. CHU (*Chin. Jour. Physiol.*, 15 (1940), No. 1, pp. 83-99).—Specimens of human liver obtained as autopsy material from 77 still-born Chinese infants, 95 Chinese children under 12 yr. of age, 50 Chinese adults, and 10 adult westerners were analyzed for vitamin A. The tissue was digested with dilute alkali, the digest extracted with ether, the ether evaporated from this extract, and the residue taken up in chloroform, the vitamin A being determined on this solution by the antimony trichloride method. The vitamin A reserves of the livers, expressed as International Units per gram of tissue, are tabulated, the data being grouped with reference to the above classes of subjects and with respect to the anatomical diagnoses which, with other pertinent information, are noted in the tables.

The average vitamin A content of the livers of Chinese newborn infants was lower than values reported for western infants, probably due to differences in the vitamin A supplies of the pregnant mothers. The results with the 95 Chinese children indicated that vitamin A reserves in the liver increased with age only during early infancy. Very low reserves were found in the group suffering from diarrhea and dysentery, and an infant with biliary cirrhosis had no vitamin A in the liver, although 924,000 I. U. of the vitamin had been administered over a period of 84 days. In a group of young children who had received very large doses of vitamin A concentrate for a prolonged period, the maximum storage of the vitamin in the liver was usually less than 10 percent of the amount administered. In tuberculosis the children showed higher vitamin A reserves than the adults, presumably due to more liberal use of cod-liver oil therapy in the children. In 12 cases of accidental death in Chinese adults the median value was 54 I. U. per gram of wet liver; 60 percent of the 50 Chinese adults and 54 percent of the 95 Chinese infants and children had vitamin A reserves of less than 50 I. U. per gram of wet liver tissue.

The state of vitamin A in the liver of the rat after feeding various forms of the vitamin, E. L. GRAY, K. C. D. HICKMAN, and E. F. BROWN (*Jour. Nutr.*, 19 (1940), No. 1, pp. 39-46, figs. 2).—Vitamin A in 20,000-unit doses was fed over a period of 48 hr. to 53-day-old rats in groups of 15. The animals were killed and the livers of each group pooled, weighed, frozen, and kept at -55° C. until used for vitamin A determinations by molecular distillation. Only traces of unchanged carotene were recovered from the livers, together with a small but definite quantity of free vitamin A alcohol. The greater part was recovered as esters, the percentage recovery being in decreasing order of U. S. P. reference oil 55.7 percent, vitamin A caproate 48.6, vitamin A stearate 44.3, distilled

ester concentrate 44.2, vitamin A alcohol 39.3, and β -carotene 9.7 percent. The type of ester was similar in all cases, suggesting a selective utilization of fatty acids by the rat for the purpose of esterifying the vitamin. The poor utilization of carotene in the large doses fed is also shown by the appearance of large amounts of the unchanged provitamin in the feces.

Mobilization of vitamin A from its stores in the tissues by ethyl alcohol, S. W. CLAUSEN, W. S. BAUM, A. B. McCOORD, J. O. RYDEEN, and B. B. BRESEE (*Science*, 91 (1940), No. 2361, pp. 318, 319).—Evidence is presented briefly from experiments on dogs indicating that ethyl alcohol has the power of increasing the vitamin A content of blood serum by mobilizing it from the liver.

Mobilization of vitamin A by alcohol, L. B. PETT (*Science*, 92 (1940), No. 2377, p. 63).—In routine comparisons of the author's visual test for vitamin A deficiency (E. S. R., 84, p. 129) with blood analyses unaccountably short recovery times, indicating higher blood vitamin A levels, were observed the day following the taking of alcohol. A few of these observations are recorded as confirming the above noted observations of Clausen et al.

Vitamin A deficiency.—III, Blood analysis correlated with a visual test, L. B. PETT and G. A. LEPAPE (*Jour. Biol. Chem.*, 132 (1940), No. 2, pp. 585–593, fig. 1).—In this investigation of the relationship between the regeneration of visual purple and the vitamin A content of the blood the visual regeneration time was determined by the method of Pett noted previously (E. S. R., 84, p. 129), and immediately after this measurement a sample of blood obtained by venipuncture was analyzed for vitamin A by a colorimetric method developed as a modification of existing procedures. In one subject receiving 20,000 International Units of vitamin A orally, the vitamin A value of the blood increased from 76 to 133 I. U. per 100 cc. within 4 hr., this increase (accounting for about 10 percent of the vitamin administered) being associated with a decrease in recovery time from 9 to 5.7 sec. In another individual the recovery time increased from 6 to 17 sec. and the vitamin A blood values decreased from 87.8 to 66.4 I. U. per 100 cc. during 12 days on a vitamin A-free diet. Oral administration of 8,500 I. U. of the vitamin on the twelfth day was followed by a decrease in recovery time to 9 sec. within 2 hr. and an increase in the blood plasma value to 117.0 I. U. per 100 cc. Following this, recovery time increased again and plasma vitamin A decreased.

In another study involving 26 people with different adaptation times, blood vitamin A values were determined and a curve (a rectangular hyperbola) was obtained, showing good correlation between the adaptation test and the blood level of vitamin A. The fact that the points showed considerable dispersion about the curve was interpreted to mean that the adaptation test is not sensitive enough to detect changes in the blood level of vitamin A due to absorption or to transference of vitamin A into the tissues. Additional interpretations of the curve are presented.

The vitamin B complex and its constituents in functional digestive disturbances, F. F. CHESLEY, J. DUNBAR, and L. A. CRANDALL (*Amer. Jour. Digest. Diseases*, 7 (1940), No. 1, pp. 24–27).—A vitamin B concentrate, representing an extract of brewers' yeast and containing 125 International Units of thiamin and 35 Sherman-Bourquin units of riboflavin per gram, was given to 44 patients for periods from 3 mo. to 1 yr.; 8 gm. daily were given as the therapeutic dose. Patients with organic disorders and those with abnormality of the duodenal bulb or of the function of the gall bladder were excluded from these tests. In 11 cases the concentrate was alternated with crystalline thiamin (1,500–2,000 I. U. per day) and in 9 cases with a riboflavin concentrate that contained no other member of the B complex (600 Sherman-Bourquin units daily). Nicotinic

acid (100-200 mg. per day) was given to 42 patients, 22 of whom previously or somewhat later received the vitamin B complex.

The specific symptoms exhibited by the patients and the responses of each symptom to treatment with the vitamin B complex are listed. Likewise, results from use of the whole B complex and nicotinic acid are tabulated for comparison. Urinary output of thiamin, determined for some patients and normal subjects by the method of Helmer (E. S. R., 78, p. 283), is also reported.

A high percentage of the patients with functional digestive disturbances were improved by the administration of the vitamin B complex. That there had been a deficiency of this complex was indicated by the therapeutic results and by the demonstration of an abnormally low excretion of thiamin. Neither the thiamin nor the riboflavin alone appeared to be as effective as the whole complex, due apparently to the beneficial effect also produced by the nicotinic acid present in the complex. The use of a vitamin B complex rather than nicotinic acid alone is recommended in the treatment of functional digestive disorders, since these seem to be associated with deficiencies of the several B factors.

Studies on rat bradycardia, D. G. H. MACDONALD and E. W. MCHENRY (*Amer. Jour. Physiol.*, 128 (1940), No. 3, pp. 608-614, figs. 3).—The effect of various B vitamins, differences in food intake, and dietary fat on the development of bradycardia in rats on a diet deficient in the constituents of the vitamin B complex and choline was tested, with results indicating that thiamin alone of the members of the B complex is effective in reducing the bradycardia, but that the quantity of food consumed is also a factor. A sparing action of dietary fat upon thiamin requirement for the prevention of bradycardia was also demonstrated, and it is emphasized that this should be considered in the assay of the thiamin potency of foods by the bradycardia method.

Vitamins in economy of food utilization (*Arkansas Sta. Bul.* 405 (1940), pp. 5-7).—This progress report deals with studies on vitamin B₁ and riboflavin in the economy of food utilization.

Vitamin B₁ content of Chinese plant beriberi remedies, E. F. YANG and B. E. READ (*Chin. Jour. Physiol.*, 15 (1940), No. 1, pp. 9-17).—Fifty-nine plant materials long used by the Chinese as beriberi remedies were analyzed for vitamin B₁. The samples included seeds and fruits, leaves, herbs, roots and rhizomes, and stems and barks. For the most part they had been sun-dried and stored and were purchased at a local (Shanghai) drug store, but in addition several of the fresh materials collected in the vicinity of the laboratory were also analyzed. The determinations, all of which were controlled by recovery experiments with added vitamin B₁, were made by the method of Yang and Platt (E. S. R., 83, p. 279). The data, reported as gamma of vitamin B₁ per 100 gm., indicate that the seeds contained significant quantities of the vitamin, plantain (*Plantago major*) seeds in particular containing 1,540 γ per 100 gm. Among the leaves, high values were obtained for leaves of mulberry (*Morus alba*), loquat (*Eriobotrya japonica*), and carpenter weed (*Brunella vulgaris*), for which values of 460 γ , 230 γ , and 320 γ per 100 gm., respectively, are reported. Barks and stems were low in vitamin B₁, and the roots contained moderate amounts.

The use of vitamin B₁ for the relief of pain in varicose ulcers, A. OCHSNER and M. C. SMITH (*Jour. Amer. Med. Assoc.*, 114 (1940), No. 11, pp. 947, 948).—Among 10 hospital patients with painful varicose ulcers treated with vitamin B₁ in doses of from 3 to 30 mg. daily, all but 1 experienced definite relief from pain in from 3 to 11, with an average of 5 days, and in a few of these cases there was also definite improvement in the healing of the ulcers. A dosage of 5 mg. 3 times a day is recommended, with doubling of the dose within 3 or 4 days if the symptoms have not subsided.

Saturation studies with vitamin B₁ [trans. title], S. MOLNÁR and M. HORÁNYI (*Klin. Wchnschr.*, 19 (1940), No. 9, pp. 204-206).—Intravenous injections of 1,000 γ of vitamin B₁ were given to 9 normal subjects and 23 with various diseases. The total vitamin B₁ content (including cocarboxylase) of the blood was determined in each case immediately preceding injection and at 5-, 10-, 15-, 20-, and 60-min. intervals after injection. Vitamin B₁ was also determined in the urine collected during the 3 hr. following the injection.

In the 9 normal subjects the vitamin B₁ content of the blood varied from 17 γ to 28 γ and averaged 19.5 γ percent. The maximum increases, which occurred from 5 to 30 min. after the injection, varied from 7 γ to 13 γ and averaged 10 γ percent. In cases including ulcer patients who had been on an ulcer diet deficient in vitamin B₁, patients with febrile conditions, a number of cancer patients, and several with Basedow's disease, the vitamin B₁ content of the blood averaged 17 γ percent (range 8 γ -24 γ), but the maximum increases, likewise occurring 5-30 min. after injection, amounted to only 1 γ -5 γ , with an average of 2.8 γ percent. In 2 patients with pernicious anemia, 1 with fever-free panmyelophthisis, and 3 with gastric or duodenal ulcer who had not been on a vitamin B₁-deficient ulcer diet, the average B₁ content of the blood was 15 γ percent, and the maximum increases after the injection were like those of the normal subjects, varying from 7 γ to 12 γ and averaging 10 γ percent. One patient with Addison's disease showed no increase in the vitamin B₁ content of the blood, most of the injected vitamin being eliminated by way of the urine; in another case, however, there was a maximum increase of 18 γ percent 15 min. after the injection.

Deficiency of vitamin B₁ in man as determined by the blood cocarboxylase, R. GOODHAET and H. M. SINCLAIR (*Jour. Biol. Chem.*, 132 (1940), No. 1, pp. 11-21, fig. 1).—Simultaneous analyses of the blood plasma of groups of individuals with various diseases were made for cocarboxylase by the authors' modification of the method of Ochoa and Peters (*E. S. R.*, 83, p. 420) and total vitamin B₁ by a slight modification of the Meiklejohn method, as described by Sinclair (*E. S. R.*, 82, p. 298). In 80 samples of blood the cocarboxylase values ranged from 0.0 to 13.0 μ g. per 100 cc., with a mean of 4.14, and the B₁ values from 1.5 to 13.0 μ g. per 100 cc., with a mean of 5.11. The correlation coefficient was 0.76 ± 0.05 , $t=5.2$. In 7 of 8 cases the values for both cocarboxylase and total vitamin B₁ were increased following vitamin B₁ injections. In the other case the total vitamin B₁ value was increased markedly after daily injection of 10 mg. of crystalline vitamin B₁ for a week, while the cocarboxylase value remained unchanged. Further evidence was also obtained in support of the statement in the earlier paper that variations in the blood cell count within certain limits do not appreciably affect the blood level of cocarboxylase. It is concluded, therefore, that the cocarboxylase content of the blood is a reasonably accurate index of saturation of the body with cocarboxylase and vitamin B₁.

In the application of the method to 111 untreated patients with various diseases, the cocarboxylase values for 40 were significantly low and 66 below the lowest normal value of 4.5 μ g. reported in the earlier paper for 26 normal subjects. Low values were definitely related etiologically to alcoholic neuritis, nutritional neuritis, and some cardiovascular disturbances, and were found to be associated, although not necessarily etiologically, with cases of anemia, subacute combined degeneration of the cord, and certain psychiatric disorders and with diminished gastric acidity. It is emphasized, however, that "vitamin deficiencies in man are almost always multiple and are, therefore, usually inadequately treated by administration of a single pure vitamin."

The pathology of the nervous system in vitamin deficiencies, H. M. ZIMMERMAN (*Yale Jour. Biol. and Med.*, 12 (1939), No. 1, pp. 23-28, pls. 7).—The noninflammatory degenerative lesions of the peripheral nerves occurring in

human beriberi, chronic alcoholism, vomiting of pregnancy, diabetes mellitus, and other organic diseases are compared with the lesions of the nervous system produced experimentally in pigeons, rats, and dogs fed vitamin B₁-deficient diets.

The pathological changes in the nervous system in human pellagra (considered as a multiple deficiency disease) are compared with the changes produced in experimental animals. In pellagra there is not only peripheral nerve degeneration but also degeneration in the posterior column and sometimes in the lateral spinal sensory and pyramidal tracts; in man there are also pathological changes in the Betz cells in the motor cortex. The Wernicke type of hemorrhagic pseudo-encephalitis occurring in the brain is frequently found in cases of vitamin B₁ avitaminosis. This same type of lesion has been produced experimentally in pigeons, dogs, and rats on vitamin B₁-deficient diets.

Photomicrographs are presented of a number of the lesions observed in the nervous system in these avitaminoses.

Prevention of hyperplasia in the forestomach epithelium of rats fed white flour. G. R. SHARPLESS (*Jour. Nutr.*, 19 (1940), No. 1, pp. 31-37).—Further study of the cause and prevention of the lesions of the squamous epithelium of rats first noted by Pappenheimer and Larimore (*E. S. R.*, 53, p. 165) as occurring on a diet of white flour is reported, with the conclusion that the preventive factors are nonspecific. In connection with a low protein diet cystine may be the preventive factor, while with a diet of white flour the principal factors for prevention appear to be all of at least three components of the vitamin B complex—lactoflavin, nicotinic acid, and at least one factor other than vitamin B₁. In discussing these findings the author explains the localization of the lesions in the forestomach, rather than in other organs in which the epithelium is of the squamous type, as probably due to local conditions which change the epithelium so that less stimulus is required to produce proliferation, and the nonspecificity of the factors preventing the lesion as each contributing in some phase of metabolism to the lowering of the sensitivity of the cell to proliferative stimuli. It is suggested that some factors may do this by increasing the sulfhydryl content of the cell.

Bisulfite binding substances (B. B. S.) in the blood and cerebrospinal fluid. H. WORTIS, E. BUEHNIG, and W. E. WILSON (*Soc. Expt. Biol. and Med. Proc.*, 43 (1940), No. 2, pp. 279-282).—A comparison of B. B. S. values in the blood and cerebrospinal fluid, as determined by a modification of the method of Clift and Cook, the technic of which is similar to that employed by Wilkins et al. (*E. S. R.*, 77, p. 424), is reported for 126 patients with various neuropsychiatric disorders. Values for 50 normal controls fell within the range previously found by Wilkins et al. for normal subjects, and the highest value, 5.75 percent, was used as the upper limit of normal. Of the entire number of patients tested, 105 gave values below this upper limit and ranging from 2.00 to 5.72 mg. percent. The spinal fluid figures for these subjects ranged from 0.42 to 3.07, with an average of 1.64 mg. percent. Among 8 cases of peripheral neuropathy in inebriates, considered to be due to vitamin B₁ deficiency, 4 showed an elevated B. B. S. in the blood or cerebrospinal fluid or both, and 4 had normal figures from which the author concludes that the B. B. S. cannot be used as an indication of vitamin B₁ deficiency. In the group of psychiatric disorders represented among the subjects no constant deviation from normal in B. B. S. was found. Paraldehyde caused an elevation of B. B. S. in the blood and cerebrospinal fluid in 24 hr. Unpublished observations indicate that the B. B. S. is not an accurate measure of pyruvic acid in the blood or cerebrospinal fluid.

Bisulfite binding substances (B. B. S.) and thiamin deficiency, M. SHILS, H. G. DAY, and E. V. McCOLLUM (*Science*, 91 (1940), No. 2362, p. 341).—Attention is called to certain precautions which must be taken in adapting the Clift and Cook method for determining B. B. S. (E. S. R., 71, p. 157) to studies of thiamin nutrition. As the food intake is an important factor in the results obtained with this method, the amount of food should be limited to an arbitrary level during the urine collection periods. The addition of considerable common salt to the diet is also recommended for the purpose of securing sufficient urine for individual study. In young adult rats on a thiamin-deficient diet there is a rapid and progressive rise in urinary B. B. S., amounting in a few days to an increase of from 200 to 400 percent and in advanced deficiencies to as much as from 600 to 900 percent. When adequate thiamin is given, the B. B. S. of deficient rats drops to normal within 24 hr. and continues within a narrow range of 3–8 cc. (expressed as cubic centimeters of 0.005 N iodine) after the diet is restricted, but when food is given ad libitum the resulting stimulation of appetite tends to mask the effect to some degree. When fat as autoclaved lard is substituted isocalorically for sucrose in the thiamin-deficient diet, there is some immediate decrease in B. B. S., but the values remain from 300 to 400 percent above normal even after feeding the fat for 2 weeks, although during this interval the growth rate and appearance markedly improve. Thiamin administration causes a drop in B. B. S. to normal values within 24 hr.

Effect of cooking upon the thiamin content of foods, E. AUGHEY and E. P. DANIEL (U. S. D. A.). (*Jour. Nutr.*, 19 (1940), No. 3, pp. 285–296).—The thiamin content of the foods tested in the raw and cooked state and in the liquids drained from the cooked products was determined by the method of Booher and Hartzler (E. S. R., 83, p. 131), which employs crystalline thiamin as the standard and estimates the thiamin value by interpolation from growth on two quantities of the test food selected on the basis of exploratory tests as presumably giving growth rates just over and under that on 3 μ g. of thiamin. Tabulated data are presented on the foods tested, the method and time of cooking, average cooked weight of 100 gm. of raw food, and thiamin content in International Units per 100 gm. of cooked food, 100 gm. of raw food and cooked food per 100 gm. raw weight, and on the percentages of thiamin retained by the cooked food, dissolved in the cooking water, and destroyed on cooking.

The materials tested included Texas and California carrots cooked by boiling and pressure-cooker methods; Maine-grown Irish Cobbler potatoes baked and boiled; Bloomsdale Savoy spinach boiled; Washington State-grown Laxton Progress peas simmered alone or with a small amount of soda; Maryland-grown Bountiful string beans boiled alone or with a small amount of soda; dried navy beans boiled alone and with soda; rolled oats and whole wheat cooked in a double boiler; whole wheat ground and baked as bread; and pork loin (lean portion) braised as chops and roasted. Among the practical conclusions drawn are that on a serving basis baked potatoes, including the skin, furnished more thiamin, and boiled potatoes, spinach, and carrots as much thiamin as cooked whole wheat or oats, or about one-tenth of a liberal daily allowance. Navy beans, because they take up less water during cooking, furnished proportionately more thiamin than cereals. Snap beans as usually eaten are not a rich source of thiamin, but a serving of green peas supplies about one-fourth to one-third of a liberal daily allowance. One serving of the lean portion of pork loin cooked either as chops or roast furnishes a plentiful daily allowance of thiamin for the adult.

Ocular manifestations of ariboflavinosis, H. D. KRUSE, V. P. SYDENSTRICKER, W. H. SEBRELL, and H. M. CLECKLEY (*Pub. Health Rpts. [U. S.]*, 55 (1940), No. 4, pp. 157-169).—Nine patients known to be receiving insufficient amounts of riboflavin and showing cheilosis and seborrheic dermatitis, already described as characteristic of ariboflavinosis (E. S. R., 58, p. 134), were found to present ocular lesions. The case histories are presented, and the observations are given in detail. Slit-lamp examinations and ocular signs revealed that the principal ocular manifestation was a keratitis, but a special type of glossitis was also observed. The occurrence in persons on a riboflavin deficiency diet of this keratitis, its similarity to the analog produced experimentally in animals in ariboflavinosis, its association in humans with other signs of ariboflavinosis, its failure to be cured by thiamin chloride, nicotinic acid, ascorbic acid, crystalline vitamin A, or fish-liver oils, but its cure (together with that of the associated conditions) by riboflavin and relapse upon withdrawal of the riboflavin therapy—all point to this ocular lesion as a specific manifestation of ariboflavinosis. Two patients with severe interstitial keratitis associated with syphilis showed marked improvement upon therapy with riboflavin, suggesting the possibility of a riboflavin involvement in these syphilitic cases.

The relationship of the dietary intake of nicotinic acid to the coenzyme I content of blood, A. E. AXELROD, E. S. GORDON, and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Amer. Jour. Med. Sci.*, 199 (1940), No. 5, pp. 697-705, figs. 2).—This study demonstrated that the coenzyme I level of blood can be increased by the ingestion of large amounts of nicotinic acid. Five normal subjects, each receiving orally 100 mg. of nicotinic acid daily, showed an average increase of 85 percent in the coenzyme I content of the blood over a 10-day period. This rather slow response was followed by a slow drop to the normal level after the nicotinic acid administration was stopped. Two normal subjects fed 1,800 mg. of nicotinic acid within 16 hr. showed very rapid increases in the blood coenzyme I content, the levels being increased within 48 hr. by 152 and 310 percent, respectively. In the one case studied completely, a fairly rapid fall was noted soon after the maximum peak was reached. In the one pellagrin studied, an increase of 144 percent was obtained after the administration of 2 gm. of nicotinic acid over a 4-day period; this level of coenzyme I was maintained for 1 mo. by the feeding of 750 mg. of nicotinic acid daily. The blood of this pellagrin was normal with respect to the coenzyme I level before the therapy was begun, indicating that analyses of the blood for this component cannot be used as a diagnostic test for pellagra.

The synthesis of nicotinic acid by rats, K. L. SHOURIE and M. SWAMINATHAN (*Indian Jour. Med. Res.*, 27 (1940), No. 3, pp. 679-683).—From nicotinic acid balance experiments on rats on diets with and without additional nicotinic acid and from analyses of the organs and tissues from these animals on autopsy, it is concluded that the rat can synthesize nicotinic acid and does not require it in the diet.

The urinary excretion of nicotinic acid, M. SWAMINATHAN (*Indian Jour. Med. Res.*, 27 (1939), No. 2, pp. 417-428, fig. 1).—The author's cyanogen-bromide-aniline method (E. S. R., 80, p. 131) was used with certain modifications in this study of the excretion of nicotinic acid by various groups in Coonoor, India. Hydrolysis of the 24-hr. urine samples with sodium hydroxide was employed to convert into nicotinic acid the derivatives which might be present in the urine, and for the final colorimetric measurement a phosphate buffer was added to stabilize the reaction. With the modified method, which is described in detail, recoveries of added nicotinic acid ranged from 95 to 110 percent.

The subjects included 10 laboratory workers of whom 4 were on diets in which wheat and 6 in which rice predominated, and 24 hospitalized patients of whom 8 had clinical conditions ascribed to dietary deficiencies (5 peripheral neuritis and 3 stomatitis) and 16 had no outward signs of dietary deficiency. Minimum, maximum, and average values for the four groups in the above order were 4.76, 8.88, and 6.77 mg.; 2.06, 4.21, and 3.15; 0.42, 2.20, and 1.15; and 0.58, 2.91, and 1.33 mg., respectively. Corresponding values following a single test dose of 100 mg. of nicotinic acid were 20.03, 37.85, and 27.87 mg.; 14.06, 26.15, and 19.69; 1.86, 13.61, and 5.10; and 1.70, 24.70, and 9.84 mg., respectively. With allowance for the estimated nicotinic acid content of the diet, the responses of the normal subjects to the test dose ranged from 12 to 29 percent of the intake.

Attempts to saturate one of the normal subjects on the rice-predominating diet by increasing test doses up to 500 mg. resulted in nicotinic acid excretion averaging only about 13 percent of the intake. "What happens to the larger fraction which is not excreted and how much is converted into trigonelline are problems of further study." In similar saturation tests conducted on one of the patients with stomatitis, the nicotinic acid excretion represented a much lower percentage of the intake. Clinically, the patient showed rapid improvement, and the mouth lesions disappeared within 4 days.

The nicotinic-acid content of cereals and pellagra, W. R. AYKROYD and M. SWAMINATHAN (*Indian Jour. Med. Res.*, 27 (1940), No. 3, pp. 667-677, figs. 2).—Average values for the content of nicotinic acid, determined by the cyanogen-bromide method of Swaminathan referred to above are reported as follows for various Indian-grown cereals: Corn, whole, white (mean of nine samples), 1.3 mg. per 100 gm.; corn, whole, yellow (nine), 1.4; rice, raw, home-pounded (four) and milled (nine), 2.4 and 1.6, respectively; rice, parboiled, home-pounded (four) and milled (nine), 4.0 and 3.8, respectively; wheat, whole (two), 5.0; refined white flour (two), 1.0; wheat germ (one), 9.1; barley (two), 2.8; oats (two), 1.0; sorghum (two), 1.4; *Eleusine coracana* (five), 1.4; and *Pennisetum typhoid-eum* (mean of two samples), 2.0 mg. per 100 gm. For comparison two samples of corn meal, one a whole and the other a degerminated white meal, were obtained from the United States; these two samples from regions where pellagra is endemic were found to contain 1.6 and 0.9 mg. of nicotinic acid per 100 gm., respectively. Ten samples of yellow corn grown in regions of endemic pellagra in Rumania were also analyzed and found to average 1.4 mg. per 100 gm., with a range from 1.2 to 1.6 mg.

Raw and parboiled rices, home-pounded and milled, were analyzed before and after cooking, the results indicating that washing and cooking may remove some 50 percent of the nicotinic acid present in rice. From the above analyses it is also concluded that the nicotinic acid in rice is concentrated in the germ and pericarp, and that the parboiling of rice causes the nicotinic acid to diffuse through the grain so that it cannot be removed upon subsequent milling. Poor rice (India) and poor corn (Rumania) diets were estimated to furnish, respectively, 12 and 15 mg. of nicotinic acid per adult male per day. It appears, therefore, that the low nicotinic acid content of the corn diets fails to explain the association of pellagra and corn.

Nicotinic acid deficiency encephalopathy, N. JOLLIFFE, K. M. BOWMAN, L. A. ROSENBLUM, and H. D. FEIN (*Jour. Amer. Med. Assoc.*, 114 (1940), No. 4, pp. 307-312).—Observations are reported on the treatment of 22 consecutive cases of an encephalopathic syndrome characterized by clouding of consciousness, cogwheel rigidities, and uncontrollable grasping and sucking reflexes. Patients with these symptoms treated by hydration or hydration plus thiamin chloride al-

most invariably died, others treated with hydration plus substances rich in the vitamin B complex showed a moderate drop in mortality, and others treated by hydration plus nicotinic acid a marked drop in mortality. It is thought that the condition described represents a complete deficiency of nicotinic acid, whereas the classic symptoms of pellagra represent a partial deficiency. The term nicotinic acid deficiency encephalopathy has been given to the syndrome. Five detailed case reports are included as representative of the series.

Pellagra, H. S. STANNUS (*Lancet* [London], 1940, I, No. 8, pp. 352-355).—The view is presented that pellagra results from a disturbance in the coenzyme-oxidase system, and evidence bearing on the problem is brought together. The catalyses of this system are outlined as follows: (1) Dehydrogenases activate the specific substrates. (2) A coenzyme, or codehydrogenase which may be common to several dehydrogenase systems, is needed to activate the dehydrogenase. Coenzymes I and II contain nicotinic acid and are, respectively, di- and triphosphopyridine nucleotides; they function in the dehydrogenase systems for lactic, citric, and hexosephosphoric acids, glucose, and alcohol; when reduced they cannot react with oxygen, oxygen carriers, or hydrogen acceptors except in the presence of another enzyme, (3) the "coenzyme factor" or "diaphorase". This latter is a riboflavin nucleotide, which itself becomes reduced in catalyzing the oxidation of the coenzyme. The coenzyme factor is oxidized, however, under the influence of (4) cytochrome, which is thus reduced, but which becomes oxidized by molecular oxygen under the catalytic action of (5) cytochrome oxidase, an enzyme that is cyanide sensitive. The cytochrome thus acts as a carrier between the two types of cell respiratory enzymes, the dehydrogenases and the oxidases. The coenzymes, the coenzyme factor, and cytochrome are widely distributed in animal tissues and in yeast.

In view of these relationships, it is thought that pellagra is due to a disturbance of the second link in the chain in which nicotinic acid plays a part; that riboflavin plays a part due to its place in the third link; that liver extract and yeast are of therapeutic value because of their enzyme content; and that the action of various factors in initiating a train of processes leading to pellagra may be explained as an attack on some link in the chain. Thus, in alcoholic pellagra, the large consumption of alcohol calls for the action of its dehydrogenase, which becomes an overwhelming competitor for coenzyme and the other enzymes in the chain. The role of sugar, work, infections, snake venom, and cyanogenetic substances as possible etiologic factors is explained as an attack on some link of the chain. Angular stomatitis and related symptoms are considered as signs of the pellagrous state, a state supervening on a fault in one or more links of the catalytic chain.

Observations on the factor curative of nutritional achromotrichia, P. GRÖGNY, C. E. POLING, and Y. SUBBAROW (*Jour. Biol. Chem.*, 132 (1940), No. 2, pp. 789, 790).—A basal vitamin B-free diet supplemented with vitamin B₁, riboflavin, and vitamin B₆ produced cutaneous lesions and achromotrichia ("graying") in rats. The addition of pantothenic acid concentrates of 40-50 percent purification in doses of 75γ-200γ in terms of pantothenic acid caused a regression of the skin lesions and a blackening of the fur. The blackening appeared first as a bluing of the skin and did not progress to completion, and depigmented areas often persisted. These concentrates, it is concluded, appear to contain one but not the only factor concerned in the cure of nutritional achromotrichia in rats.

The B vitamins and fat metabolism.—III, The effects of vitamin B₆ upon liver and body fat, G. GAVIN and E. W. McHENRY (*Jour. Biol. Chem.*, 132 (1940), No. 1, pp. 41-46).—In continuation of this series (E. S. R., 81, p. 877), evidence is

presented showing that the administration of crystalline vitamin B₃ in conjunction with thiamin, riboflavin, and choline to rats on a fat-free diet causes a slight increase in body fat and an increase in body weight; that nicotinic acid increases slightly the effect of vitamin B₃ on body fat but not on body weight; that neither vitamin B₃, nicotinic acid, nor riboflavin prevents the deposition of fat in the liver following the administration of thiamin: but that the amount of liver fat remains normal if choline is administered, either alone or with any combination of the above factors.

The evaluation of the intradermal dye test for vitamin C in health and disease, I. BAKSHI, B. D. KOCHHAR, and A. Q. MALIK (*Indian Jour. Med. Res.*, 27 (1940), No. 3, pp. 695-703, figs. 2).—The Rotter intradermal vitamin C test (*E. S. R.*, 78, p. 371) was given to 140 apparently healthy students of a medical college and 200 patients suffering from various diseases in a hospital in Lahore, India, and the results were compared with blood plasma ascorbic acid values for the same subjects. Statistical analysis by the chi-square method of the relation between the blood values classified in three groups of less than 0.8, 0.8-1.5, and 1.5 mg. per 100 cc. or more and the decolorization times in groups of less than 5, 5-10, 10-15, and 15 or more min. gave values of $\chi^2=59.5$ for the students and 8.34 for the patients. These values, when referred to Fisher's tables for 6 degrees of freedom, establish a significant degree of association between the two variables in the case of the students but not of the patients. However, the scatter diagrams for the students show that the degree of correlation was not sufficiently high to make the test of any use in clinical practice.

Of the students 20 gave blood plasma ascorbic acid values of less than 0.8, 81 of 0.8-1.5, and 39 of 1.5 mg. or more per 100 cc., while of the patients 60 gave values in the first group, 138 in the second, and 2 in the third. Classified by clinical diagnosis, the lowest blood values were for 79 subjects classed as miscellaneous, with values of 0.72 ± 0.23 mg. per 100 cc., followed by 14 cases of pneumonia with an average of 0.76 ± 0.17 mg. per 100 cc., and the highest for 9 cases of gastric and intestinal disease (1.03 ± 0.19) and tuberculosis (1.05 ± 0.25 mg. per 100 cc.).

The bound ascorbic acid of animal tissues [trans. title], P. HOLTZ (*Hoppe-Seyler's Ztschr. Physiol. Chem.*, 263 (1940), No. 3-5, pp. 187-205).—The author advances the hypothesis, supported by experimental evidence obtained with the cooperation of H. Walter, that ascorbic acid in animal tissues exists partly in the free form and partly bound to protein. The customary method of determining ascorbic acid in animal tissues and fluids by deproteinization and titration of the protein-free filtrate measures only the free form. To determine the bound form it is necessary to free it from protein by hydrolysis of the tissues with hydrochloric acid or by the action of proteolytic enzymes such as pepsin and papain, or by prolonged autolysis (which however sets free only a part of the ascorbic acid). The best method for the quantitative freeing of the bound ascorbic acid consists in treating the sulfosalicylic acid or trichloric acid precipitated protein for 10 min. at 100° C. with $N/2$ HCl in an atmosphere of CO₂. Cell-free organ extracts, body fluids such as blood, and human and cow's milk have also been shown to contain some bound ascorbic acid. In milk this can be set free in part by simple heating.

The bound ascorbic acid is thought to be the reserve or depot form of the vitamin. In contrast to the free form it withstands oxidation and decomposition, and does not decrease appreciably for several days on the deficient diet. The working hypothesis is advanced that the biological synthesis of ascorbic acid in the organism involves binding with protein.

The protein bound form of vitamin C [trans. title], P. HOLTZ and H. WALTER (*Klin. Wchnschr.*, 19 (1940), No. 6, pp. 136, 137).—This summary of the study

noted above contains a few figures showing the proportion of free and bound ascorbic acid in certain biological tissues and fluids. Among these are the following: The kidneys of guinea pigs on a normal diet, free ascorbic acid 5.83 and bound 7.14 mg. percent, and on a vitamin C-deficient diet 3.68 and 7.05 mg. percent, respectively; intestinal tract of guinea pigs on a normal diet, free ascorbic acid 16.69 and bound 6.39 mg., and on a deficient diet, free 3.20 and bound 5.20 mg. per 100 cc.; cow's milk, free 0.98 and bound 0.60 mg.; cow's milk heated in an atmosphere of CO₂, free ascorbic acid 1.41, and heated with HCl in an atmosphere of CO₂, free ascorbic acid 1.62 mg. per 100 cc.

A comparison of the utilization by guinea pigs of equivalent amounts of ascorbic acid (vitamin C) in lemon juice and in the crystalline form, E. N. TODHUNTER, R. C. ROBBINS, G. IVEY, and W. BREWER. (Wash. Expt. Sta.). (*Jour. Nutr.*, 19 (1940), No. 2, pp. 113-120).—The comparison was made on the basis of weight gains, scurvy scores, and the ascorbic acid content of the blood and adrenals of two matched groups of 9 guinea pigs each, placed on a basal vitamin C-free diet at the age of 6-8 weeks and weight of approximately 300 gm. and after 13 days given supplementary feeding of 1 cc. of lemon juice daily for one group and for the other group the same quantity of ascorbic acid as 1 cc. of ascorbic acid solution. Feeding of the supplements was continued for 20 days, and on the following day, immediately after the removal of 1 cc. of blood from the heart, the anesthetized animals were killed, the adrenals and blood samples analyzed for ascorbic acid, and scurvy scores determined. No group differences were noted in the average adrenal weights, total ascorbic acid content of the adrenals, and the ascorbic acid content of the blood plasma, and although there were wide individual differences in the scurvy scores, more low scores were recorded in the lemon juice than in the ascorbic acid group.

In a repetition of the work with only 6 animals in each group and a larger dose of ascorbic acid (4 cc. of lemon juice or its equivalent), the ascorbic acid content of the blood and adrenals was again similar for the two groups and considerably higher than in the first series. The scurvy scores were all negative on the lemon juice diet but were noted as "traces" in four of five animals on the ascorbic acid diet.

These data, although not conclusive, are thought to indicate the possibility that lemon juice may contain another factor than ascorbic acid concerned in the prevention of the hemorrhages which are characteristic of scurvy.

Vitamin-C (ascorbic acid) nutrition of Utah State Agricultural College students found low, A. P. BROWN (*Farm and Home Sci. [Utah Sta.]*, 1 (1940), No. 4, pp. 2, 11).—Of 127 college students on whom blood plasma ascorbic acid tests were made, 7.1 percent had values of 1 mg. or more per 100 cc. of plasma, 15 between 0.8 and 1 mg., 47.2 between 0.4 and 0.8 mg., and 30.7 percent values of 0.4 mg. or less per 100 cc. In terms of commonly accepted standards, somewhat less than one-fourth of the total number of students were in a satisfactory state of vitamin C nutrition. The health significance of low blood plasma vitamin C levels is discussed and summarized as "the chance of lowered efficiency through constant fatigue, a threat of impaired bodily function in the resistance to infection, and the probability of impaired mental health through a continued feeling of irritability and of apprehension."

The effect of vitamin C on the calcium, phosphorus, and nitrogen metabolism in scurvy and osteomalacia, H. I. CHU, S. H. LIT, K. C. CH'EN, T. F. YÜ, H. C. HSU, and T. Y. CHENG (*Chin. Jour. Physiol.*, 15 (1940), No. 1, pp. 101-117, figs. 3).—Details are reported for balance studies conducted on two patients with mild scurvy and one with osteomalacia. The diets were very low in vitamin C, but furnished adequate protein and calories and an adequate cal-

cium intake administered as calcium lactate. Vitamin C, administered after three or four preliminary control periods, was given by mouth in the form of Cebion in 100-mg. doses three times daily for four or five periods. The vitamin D deficiencies found developing were corrected by the administration of Vigantol.

Serum Ca and inorganic P were found to be essentially normal in both cases of scurvy, the Ca retention was low in one case and normal in the other, and neither Ca nor P retention nor that of N was influenced by the administration of saturating doses of ascorbic acid. P and N retentions were, however, increased by an increase in protein and calorie intake. In the case of osteomalacia the serum Ca and inorganic P were low and Ca retention was minimal in spite of high Ca intake. This abnormal Ca and P metabolism was not affected by doses of vitamin C and was only corrected by administration of vitamin D. The results are interpreted as evidence that there is no disturbance in the Ca and P metabolism in scurvy, and that vitamin C has no effect on the metabolism of these elements.

The occurrence of C avitaminosis upon an exclusive meat diet [trans. title], W. RUDOLPH (*Klin. Wchnschr.*, 19 (1940), No. 4, p. 84).—The case is cited of a man obliged to live for more than a year on an exclusive meat diet (muscle, liver, heart, kidneys, and bone marrow of antelope), except for the first 3-4 mo. when raw onions were available. About 1 kg. of meat and when available 200-250 gm. of onion were eaten daily. After 3-4 mo., as the supply of onions was exhausted, increasing weakness developed and bleeding and shrinking of the gums was evident. These symptoms increased in intensity, and after about a year extreme looseness of the teeth was observed as in typical scurvy. When a more normal diet, with a few fresh vegetables and a rich supply of fresh fruit, was finally available, improvement was noted within a few days, a feeling of well-being was regained, and within 3 weeks all symptoms of vitamin C deficiency had disappeared. This case, indicating the complete ineffectiveness of animal tissues in meeting the body's need for vitamin C is cited in refutation of the claims of Rietschel and Schick (*E. S. R.*, 83, p. 715).

Vitamin C in tuberculosis, C. E. CHANG and T. H. LIAN (*Amer. Rev. Tuberc.*, 41 (1940), No. 4, pp. 494-506, figs. 4).—In determinations made on 100 tuberculous patients, vitamin C in the blood plasma was found to vary from 0.03 to 0.60 mg. per 100 cc.; in the 24-hr. urine the range was from 1.30 to 69.54 mg. These values are appreciably lower than those obtained in the 10 normal persons studied, for whom blood plasma values for vitamin C varied from 0.64 to 1.14 mg. per 100 cc., and urinary values varied from 24.40 to 72.60 mg. per 24 hr.

Classification of the tuberculous cases indicated that the more severe the tuberculous infection the lower the vitamin C level in the blood and urine; cases complicated with idiopathic pleural effusion showed the lowest blood concentration. Saturation tests performed on a few subjects indicated that the degree of unsaturation of vitamin C in the body is proportional to the severity of the tuberculous infection.

A study of two hundred and forty breast-fed and artificially fed infants in the St. Louis area.—I, A comparison of prophylactic antirachitic effects of 135 and 200 unit irradiated evaporated milks, 200 unit irradiated fresh milk and human and nonirradiated evaporated milk fortified with 800 to 1,000 units of vitamin D as viosterol, E. C. ROBINSON (*Amer. Jour. Diseases Children*, 59 (1940), No. 4, pp. 816-827, figs. 3).—The healthy infants selected were grouped according to the type of feeding and source of vitamin

D and placed on the group formulas before the tenth day of life. Physical examinations, including measurements of weight, height, head, and chest, were made at 5 or 6 weeks of age and every 4 weeks thereafter, and roentgenograms were made routinely every 8 weeks; if these indicated questionable or active rickets, roentgenograms were made every 4 weeks until healing was observed. The majority of the infants were studied for at least a year.

"The findings on the incidence of rickets are presented by table and by graph. Positive evidence of rickets was found in the roentgenograms in 33 percent of the cases. In 24.9 percent of these the appearances were those of moderate or marked rickets; in 8.2 percent, of slight rickets." Viosterol in a daily dose of 5 drops (800-1,000 U. S. P. units of vitamin D) was sufficient to protect breast-fed infants against rickets, but did not suffice to protect infants fed nonirradiated milk. "Irradiated milk containing 135 and 200 U. S. P. units of vitamin D to the quart did not protect against rickets. Two hundred-unit whole milk was more protective than 200-unit evaporated milk. In most of the cases rickets healed spontaneously without increase of vitamin D during the summer months."

Do α -tocopherol additions to the normal diet influence lactation? [trans. title] C. BENNHOLDT-THOMSEN (*Klin. Wchnschr.*, 19 (1940), No. 5, pp. 102-104).—Four professional wet nurses served as subjects of this study. During the period of investigation they received essentially the same basal diet, and each mother nursed only her own child. A record was kept of the total milk production, the amount consumed by the infant in each case (determined by weighing before and after nursing) being added to the amount obtained by manual expression.

Two of the subjects in the thirtieth and the ninth weeks of lactation, respectively, were maintained on the normal diet for 21 days, after which for 35 days the first subject was given daily doses of 10 mg. of synthetic α -tocopherol dissolved in sesame oil, while the second was given only the sesame oil. After an intermediate 14-day period on the basal diet alone, the dosages were resumed with reversal of the subjects, twice the initial doses being given for the first 14 days and 3 times the initial amounts for a succeeding 14-day period. Both subjects were then given only the basal diet for a period of 28 days. These experiments, with the omission of the 21-day preliminary period, were repeated with two other subjects in the thirty-fourth and the ninety-fifth weeks of lactation.

The findings on milk production and milk fat content indicated that the quantity of milk was dependent on the stage of lactation, that the fat content was related to the quantity of milk, and that both of these factors were independent of the dietary management employed in this study. It is concluded, therefore, that the addition of α -tocopherol to a normal diet does not further lactation either with regard to the quality (fat content) or the quantity of the milk produced.

The prevention and cure of nutritional muscular dystrophy in the rabbit by α -tocopherol in the absence of a water-soluble factor, C. G. MACKENZIE, M. D. LEVINE, and E. V. MCCOLLUM (*Jour. Nutr.*, 20 (1940), No. 4, pp. 399-412).—Continuing this line of investigation (*E. S. R.*, 83, p. 382), attempts were made to confirm the report of Morgulis et al. (*E. S. R.*, 81, p. 89) that two or more nutritive factors are required in the prevention and cure of muscular dystrophy in the rabbit. Employing a previously described dystrophic diet, muscular dystrophy was prevented or cured by adding α -tocopherol to the diet without the addition of a water-soluble factor. No quantitative relationship between α -tocopherol and a water-soluble factor could be demonstrated. The

average daily antidystrophy requirement of the rabbit was found to lie between 0.6 and 1.0 mg. of α -tocopherol per kilogram of body weight. Symptoms of the disorder are further discussed with reference to the action of vitamin E.

Vitamin E in the treatment of muscular dystrophies and nervous diseases. F. BICKNELL (*Lancet* [London], 1940, I, No. 1, pp. 10-13).—The work of L. Einarson and A. Ringsted,^a suggesting that the muscular dystrophies, amyotrophic lateral sclerosis, and tabes dorsalis are due to a deficiency of vitamin E, is discussed briefly. Case histories are presented of 28 subjects, chiefly children, given fresh wheat germ ($\frac{1}{2}$ oz. twice daily) in treatment of such muscular and neuromuscular disorders. Wheat germ rather than α -tocopherol was administered, since it was considered that the myotrophic and neurotrophic factors might not be identical with the antisterility vitamin itself, but only associated with it in the wheat-germ oil.

Except in advanced cases, the treatment gave promising results, thus supporting the contention that these muscular dystrophies and nervous diseases are deficiency diseases and curable. It is recognized that the dietary deficiency itself may not be the cause of the muscular and nervous degeneration, but it is argued that an abundant supply of the vitamin necessary for the nourishment of the cell would make it more resistant to the causative factor.

Vitamin E and neuromuscular diseases. V. DEMOLE (*Lancet* [London], 1940, I, No. 9, p. 431).—Apropos of the paper of Bicknell noted above, a number of studies, including that of Goettsch and Ritzmann (*E. S. R.*, 83, p. 382), are cited as evidence bearing on the therapeutic equivalence of pure tocopherol and its acetate with natural vitamin E. A parallel is drawn between the late onset of neuromuscular disturbances observed during trials with young rats and the relatively late appearance of myopathies in children. It is suggested that attention should be directed in such cases toward ascertaining the history of the children, and if possible the mother, "in the hope of finding the missing link between the antisterility and neuromuscular effects."

Comparison of the antihemorrhagic activity of natural and synthetic vitamin K₁ with the proposed standard 2-methyl-1,4-naphthoquinone. A. D. EMMETT, R. A. BROWN, and O. KAMM (*Jour. Biol. Chem.*, 132 (1940), No. 1, pp. 467, 468).—In accordance with a previous suggestion of Thayer et al. (*E. S. R.*, 83, p. 857) that the stable and exceptionally potent 2-methyl-1,4-naphthoquinone be used as a standard of reference in comparing the potency values of vitamin K preparations from different laboratories, the biological activity of 1 γ of this quinone was defined as 1 standard unit of vitamin K₁. In a series of experiments with about 260 chicks, using the Thayer-Doisy method (*E. S. R.*, 81, p. 406), it was found through running the standard concurrently and using the master curve that the standard unit was equivalent to 1.98 chick units. The conversion factor, therefore, was 0.5.

The potencies of several samples of natural and synthetic vitamin K₁, furnished by Doisy and by Merck & Co., were determined and expressed in chick units and standard units. The preparations, natural and synthetic, had about the same potency values, the average being about 450 units per milligram, based on 2-methyl-1,4-naphthoquinone. It is pointed out that this is a somewhat higher value for natural vitamin K₁ than the 262 units reported by Almqvist and Klose (*E. S. R.*, 83, p. 736).

^aEffect of chronic vitamin E deficiency on the nervous system and the skeletal musculature in adult rats: A neurotropic factor in wheat germ oil. Copenhagen: Levin & Munksgaard; London: Oxford Univ. Press, 1938, pp. 163, pls. 2, figs. 95.

The vitamin K activity of 4-amino-2-methyl-1-naphthol and 4-amino-3-methyl-1-naphthol, A. D. EMMETT, O. KAMM, and E. A. SHARP (*Jour. Biol. Chem.*, 133 (1940), No. 1, pp. 235, 286).—Data showing the potency of these two preparations are reported. In terms of chick units the two compounds averaged 2,415 and 1,567 units per milligram, respectively: based on 2-methyl-1,4-naphthoquinone, the averages were 1.203 and 784 units per milligram. Clinically the 4-amino-2-methyl-1-naphthol gave excellent results. "Daily doses ranging from 3,600 to 7,200 curative chick units given intravenously restored to normal severe prothrombin deficiency of obstructive jaundice within 2 to 3 days. Infants have responded within 12 hr. to a dosage of 1,800 units, as have dogs with severe prothrombin depletion induced by biliary fistula."

The prothrombin changes in banked blood, E. R. ZIEGLER, A. E. OSTERBERG, and M. HOVIS (*Jour. Amer. Med. Assoc.*, 114 (1940), No. 14, pp. 1341, 1342, figs. 3).—A study of the prothrombin content of blood drawn in sterile tubes and stored in the refrigerator from 1 to 37 days showed that a decrease occurred over a period of time to a level of 40 percent of the original content. It is concluded, therefore, that in cases in which it is desired to raise the prothrombin content of the blood by transfusion, old banked blood is not a suitable agent.

The prothrombin in preserved blood, A. J. QUICK (*Jour. Amer. Med. Assoc.*, 114 (1940), No. 14, pp. 1342, 1343).—Determinations of prothrombin concentrations and clotting times of plasma at increasing time intervals indicated that the prothrombin of decalcified blood diminishes on standing, and support the conclusion that stored blood is inferior to fresh blood for controlling bleeding in jaundice.

The use of 2-methyl-1,4-naphthoquinone (a synthetic vitamin K substitute) in the treatment of prothrombin deficiency in patients, J. E. RHODES and M. T. FLIEGELMAN (*Jour. Amer. Med. Assoc.*, 114 (1940), No. 5, pp. 400, 401).—All but 1 of 10 patients tested responded satisfactorily to daily oral doses of 1-4 mg. "In 3 cases hemorrhagic phenomena occurred before the first dose was given. In all these the hemorrhage was controlled. 2-Methyl-1,4-naphthoquinone appears to be the most potent agent for the treatment of prothrombin deficiency so far employed clinically. No toxic effects were observed."

Correction of prothrombin deficiencies by means of 2-methyl-1,4-naphthoquinone injected intramuscularly, W. D. ANDRUS and J. W. LOEB, JR. (*Jour. Amer. Med. Assoc.*, 114 (1940), No. 14, pp. 1336, 1337).—The injection therapy (using the compound dissolved in corn oil) administered to a total of 28 cases with various diagnoses was found effective in restoring the plasma prothrombin level in the absence of severe liver damage. "Single injections of as little as 2 mg. of this substance restore the level of plasma prothrombin by as much as 48 percent. and the effect is evident as early as 8 hr. after injection. The effect of a single injection may be prolonged for as long as a week, unless adverse factors such as operations on the biliary tract or other liver damage supervene. No toxic effects have been noted resulting from doses of as much as 4 mg. in patients or in animals."

Production of "prothrombin deficiency" and response to vitamins A, D, and K, M. C. ELLIOTT, B. ISAACS, and A. C. IVY (*Soc. Exptl. Biol. and Med. Proc.*, 43 (1940), No. 2, pp. 240-245).—As determined by a modification of the Quick method, which is outlined, the mean prothrombin time in 120 rats weighing 200-370 gm. and maintained from weaning on an adequate stock diet was 09.8 ± 0.9 (S. E.) sec. The standard deviation of the distribution was 9.9 sec. In a series of 30 animals it was found that the prothrombin time for any given rat was reliable from week to week within normal limits, and that weekly bleeding (by cardiac puncture) did not affect the prothrombin time significantly.

Of a group of 66 normal rats placed on the control diet, 7 parts, mixed with Petrolagar, 3 parts, and containing 20 percent by weight of mineral oil, 56 developed a prolongation of the prothrombin time within 36 days. The median prothrombin time for these animals was 199 sec. (range 118-1,800+ sec.) as compared with an average control time of 70 sec. (46-90 sec.) for the group of 66. Two of the rats failed to develop a prolonged prothrombin time even after 77 days on the diet. The other animals of the group either died of heart puncture (4) or were discontinued at an early stage. That the effect of the Petrolagar was due to the mineral oil component was shown by the results obtained in a repetition of the experiment, using plain mineral oil (20 percent) in place of the Petrolagar. It is noted that this method of producing prothrombin deficiency is very convenient and that it has potentialities for being developed into an assay method for vitamin K. In another experiment, using 33 rats whose prothrombin times had been increased by the Petrolagar diet, 10 were given 50,000 International Units of vitamin A in oil, 11 were given 500 I. U. of viosterol in oil, and 8 received 2,000 Almquist units of vitamin K, the administrations in all cases being by subcutaneous injection. The vitamin A had no effect, the viosterol caused a significant improvement, and the vitamin K returned the prothrombin time to normal.

Diseases of metabolism and nutrition: Review of certain recent contributions, I, II, (*Arch. Int. Med.*, 65 (1940), No. 2, pp. 390-460, fig. 1).—This annual review (*E. S. R.*, 83, p. 425), which contains 319 references to recent literature, is given in two parts.

I. *Diseases of metabolism*, R. M. Wilder and H. C. Browne (pp. 390-416).—The greater part of this review is devoted to diabetes mellitus. Other conditions discussed briefly are diabetes insipidus, gout, obesity, and xanthomatosis (lipoid disease).

II. *Nutrition*, H. R. Butt (pp. 417-460).—In the introduction to this review, which is devoted almost entirely to vitamins, the author states that "of the many interesting advances in the work on nutrition during the past year, the isolation and the synthesis of vitamins B₆ and K and the therapeutic application of vitamins B₆, K, and riboflavin have been perhaps the most outstanding."

Dietary deficiencies and iron salts in hookworm infections, G. F. Otto and J. W. LANDSBERG (*Amer. Jour. Hyg.*, 31 (1940), No. 2, Sect. D, pp. 37-47, fig. 1).—Seventeen young dogs in two litters were used in these experiments. One dog from each litter was maintained on the standard stock diet, while the other 15 were placed on a generally deficient diet; 8 of the latter group were each given daily doses of 3,000-6,000 mg. of iron-ammonium citrate. After 42 days on these diets the dogs were experimentally infected with hookworm larvae and observed under the same dietary regimes until death. Hemoglobin concentration, red blood cell and reticulocyte counts, and packed cell volume were determined weekly or oftener. At death the worms recovered from the intestinal tract were counted, and paraffin sections of the bone marrow and internal organs were prepared and stained. It was found that "the additional iron stimulated a marked but apparently transient erythropoiesis; it had no effect upon the development or persistence of the worms. Likewise it did not in any way prevent or delay the development of fatal anemia." The 2 well-nourished animals, on the other hand, were able successfully to combat the infections which were fatal to the other dogs. It is concluded, therefore, that a balanced and adequate diet is of more fundamental importance than iron therapy in the development of immunity to hookworm infection, although iron therapy may well supplement general dietary improvements and removal of the worms with an anthelmintic.

TEXTILES AND CLOTHING

Identification of the textile fibers, J. H. SKINKLE (*Rayon Textile Mo.*, 21 (1940), No. 8, pp. 37-39).—A scheme is presented for the chemical identification of fibers of glass, asbestos, weighted silk, silks, hairs, casein, acetate rayon, vinyl resin, Nylon, viscose and cupra rayons, casein-viscose mixtures of the Cisalfa type, jute and hemp, and cotton, flax, and ramie. The flame and chemical tests used are described.

Wool shrinkage research, R. T. CLARK. (Coop. U. S. D. A.). (*Montana Sta. [Bien.] Rpt. 1939-40, pp. 15, 16*).—The most accurate and cheapest sampling method for determining the shrinkage of the wool producer's own clip was the aim of comparisons of sampling technics.

Proper evaluation of special finishes for textiles, E. FREEDMAN (*Rayon Textile Mo.*, 21 (1940), No. 8, pp. 55-57, fig. 1).—This rather general survey without reference to specific substances or trade names points out that the evaluation of antiseptic finishes is based upon (1) their ability to remain germ-free, (2) their destructive action on germs, and (3) the permanence of the finish; that crease resistance may be evaluated by the size of the crease angle measured at a definite humidity and crush resistance by the ratio of the pressure to compress the pile to the energy of recovery; that water-resistant finishes that also resist dry-cleaning and washing are now on the market; that finishes to render textiles more resistant to abrasion vary considerably in value, those to reduce the incidence of runs and snags having proven without worth; that acetate rayons dyed with certain blue dyestuffs are subject to reddening in spite of applied finishes; that mothproofing finishes may be evaluated by various tests involving the use of the larvae; and that flame-retardant finishes should not affect adversely the hand and appearance of the fabric and should be harmless and permanent. It is stressed that to retain the goodwill of consumers the textile industry should (1) engage in research to determine whether the finish is capable of producing the effect claimed, (2) restrict each finish to the type of textile fiber to which it imparts a substantial effect, (3) subject each finish to biological tests to make certain that it will not prove injurious, and (4) study the degree of permanence under conditions incidental to use and see that this information is affixed by tag or label to the merchandise. In the matter of terminology, water-resistant, fire-retardant, and reodorize are offered as more accurate than water-repellent, flameproof, and deodorize, respectively, and the term antiseptic, it is noted, should be qualified.

HOME MANAGEMENT AND EQUIPMENT

Family income and expenditures: Middle Atlantic, North Central, and New England regions.—I, Family income. Farm series, D. S. MARTIN, D. MONROE, D. S. BRADY, and E. PHELPS (*U. S. Dept. Agr., Misc. Pub. 383* (1940), pp. IV+258, figs. 5).—This report, the sixth in the series on family income and expenditures, is the second in the farm series, and presents information similar to that previously reported for farm (E. S. R., 83, p. 286) and for urban and village (E. S. R., 84, p. 429) families.

New soap substitutes unsatisfactory for general home laundering, J. E. RICHARDSON (*Montana Sta. [Bien.] Rpt. 1939-40, pp. 32, 33*).—This is a brief summary of the results of a comparison of soap and certain of the new detergents in laundering.

MISCELLANEOUS

Bibliography of tropical agriculture, 1939 (*Roma: Internatl. Inst. Agr., 1940, pp. VII+497*).—A continuation of this bibliography (E. S. R., 82, p. 431).

Elements of statistical reasoning, A. E. TEBLOAR (*New York: John Wiley & Sons; London: Chapman & Hall, 1939, pp. XI+261, figs. [47]*).—Explanations are given of the frequency distributions of the normal curve and their relation to sampling. The basis for the derivation of the more common statistical constants are presented and the formulas given for them.

Science works for the farmer: Fifty-second Annual Report [of Arkansas Station, 1940], [W. R. HORLACHER] (*Arkansas Sta. Bul. 405 (1940), pp. 45, figs. 9*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-third Annual Report, Colorado Experiment Station, [1940], I. E. NEWSOM (*Colorado Sta. Rpt. 1940, pp. 62*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Serving Montana agriculture through research: Forty-sixth and Forty-seventh Annual Reports of the Montana Agricultural Experiment Station, July 1, 1938, to June 30, 1940, C. MCKEE ET AL. (*Montana Sta. [Blen.], Rpt. 1939-40, pp. 68, fig. 1*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-ninth Annual Report of the New York State Agricultural Experiment Station, [1940], P. J. PARROTT (*New York State Sta. Rpt. 1940, pp. 58*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Report of the Puerto Rico Experiment Station, 1939, [A. LEE] (*Puerto Rico Sta. Rpt. 1939, pp. II+126, pl. 1, figs. 43*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

What's new in farm science: Annual report of the director, [Wisconsin Station, 1940], I, compiled by N. CLARK and N. HOVELAND (*Wisconsin Sta. Bul. 450 (1940), pp. [2]+80, figs. 19*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Alaska College and Station.—Dr. Earl Graves has been appointed veterinarian in charge of research and extension. It is expected that special attention will be given to diseases of poultry.

Colorado College and Station.—A wool laboratory has been equipped, including a scouring room and classroom and a room for technological studies. Additional courses are to be offered, and increased facilities will be available for the wool research program.

Idaho University and Station.—Godfrey L. A. Ruehle, professor of bacteriology and bacteriologist from 1926 to 1929 and subsequently senior bacteriologist in the Insecticide Control Laboratory of the U. S. Food and Drug Administration, died in Washington, D. C., on January 31 at the age of 56 years. He was a native of Minnesota, but was educated in pharmacy and bacteriology in the University of Washington. He had also served as an assistant bacteriologist in the New York State Station from 1911 to 1918 and as research assistant and associate in the Michigan College and Station from 1918 to 1926.

Minnesota University and Station.—Dean and Director W. C. Coffey has been appointed acting president to take office on the retirement July 1 of President Guy S. Ford.

To facilitate research on foreign-type cheese the dairy division of the station has added a series of six storage rooms equipped with temperature and humidity controls. Each room has a storage capacity of about 200 lb. of cheese. The cheese manufacturing department has also been enlarged and rearranged and new equipment added, including a pasteurizer and a new hydraulic cheese press with a capacity of 1,000 lb. Since 1933, when research on foreign-type cheeses was undertaken, the station has developed and perfected methods for producing blue or Roquefort-type cheese and Gorgonzola- and Trappist-type cheeses. With the new equipment, efforts will be made for shortening the ripening time of these cheeses and also for investigating the manufacturing of other foreign-type cheeses. The dairy division is also completing a \$25,000 enlarging and remodeling of its market milk department to include a complete set-up for receiving, pasteurizing, bottling, and storing fluid milk.

The latest field crop introduction to be announced in the station is Marmin, a new winter wheat. This variety was developed in cooperation with the U. S. Department of Agriculture as a selection from a cross of Marquis with Minturki and is said to combine the desirable qualities of both.

Eight new field corn hybrids are being released by the station and with the six that were released in 1940 will supply for the first time adapted hybrid varieties for all the important corn-growing regions in Minnesota, although these adaptation zones vary from 85 to 115 days in time of maturity.

Horticulturists of the station have recently introduced several new vegetables, vine crops, and flowers. Among these introductions are Green Gold squash, a winter-type variety of 3-4 lb.; Zenith bean, a brown-eyed, dry shell bean of good baking quality; Golden Gopher, a new muskmelon, chiefly important because of its resistance to *Fusarium* wilt; Midget cucumber, a new bush or dwarf variety

for home garden and pickling purposes; and the Daisymum. Sioux, and Winona, greenhouse chrysanthemums for cut-flower production.

Montana College and Station.—Layton S. Thompson has resigned as instructor and assistant in agricultural economics as of April 1 to accept a research position with the Federal Land Bank at Wichita, Kans.

New York State Station.—Thais A. Merrill, specialist in pomology in the Michigan Station, has been appointed associate in research (horticulture) and given charge of the Vineyard Laboratory at Fredonia, effective April 1.

North Dakota College and Station.—During the past year the station has given special attention to means of securing public appreciation of its work. There is an increasing demand on the part of farmers for first-hand discussions and demonstrations by those actually doing research work. This is due in part to the fact that many research fields are not represented in extension organizations and in part to a growing alertness on the part of the abler farm managers and operators, many of whom are interested in progress reports and particularly desire opportunity to see researches in progress. During January the staff presented the results of investigations to 36 employees of cooperative grain elevators who attended a 4 weeks' special training school at the college, to about 150 employess of the U. S. D. A. Farm Security Administration who attended a 1-week training conference, and to a group of 50 real estate owners and managers at a 2-day conference on real estate problems. In February about 450 farm men and women attended a 3-day farm and home conference at which station workers presented their results on such diverse projects as frozen foods, the blights on durum wheat in 1940, hybrid corn tests, yield and milling and baking tests on new hard red spring wheats, wheat storage, sheep diseases, native and introduced grasses, the trends in the livestock market, etc. Special tours were made of the research laboratories. Director H. L. Walster also addressed a group of about 200 producers of potatoes at one of their monthly potato clinics, in which he reviewed the history of potato research at the station and discussed the need for ample financial support of a broad-scale attack upon the problems of marketing table stock.

A new division of animal industry has been organized in the station to include the departments of animal and human nutrition, animal husbandry, dairy husbandry, poultry husbandry, and veterinary science and with J. H. Longwell of the Illinois University and Station as chief beginning July 1. E. J. Thompson, chairman of the department of animal husbandry, has resigned to engage in commercial work.

Leave of absence from February 25 until May has been granted Director Walster, who will be one of a party of scientists and journalists who are making a good will tour of South America under the auspices of the Carnegie Endowment for International Peace. J. R. Dice is serving as acting director.

Clemson College.—Dr. E. W. Sikes, president from 1925 to 1940, died January 8, aged 72 years. A native of North Carolina, he received the M. A. degree from Wake Forest College in 1891 and the Ph. D. degree from Johns Hopkins University in 1897. His early career was as a teacher, as dean of Wake Forest College, and as president of Coker College. He was also a member of the North Carolina State Senate in 1911 and the author of numerous books on southern history.

South Dakota College and Station.—J. E. Graphius has been appointed associate professor of agronomy and associate agronomist. Walter P. Cotton has been appointed assistant economist in charge of marketing research as of April 1 vice L. M. Brown, who has been given indefinite leave for army duty from March 22.

EXPERIMENT STATION RECORD

VOL. 84

JUNE 1941

No. 6

EUGENE DAVENPORT, MIDWESTERN PIONEER AND PROPHET

The rapidly dwindling roll of agricultural college and experiment station leaders in service a half century ago was further curtailed on March 31, 1941, by the death of Dr. Eugene Davenport, of Illinois and Michigan. Dr. Davenport died at his boyhood home in the latter State, to which he had returned in 1922 upon retirement as dean and director emeritus of the Illinois University and Station. He was nearing his eighty-fifth birthday, having been born at Woodland, Mich., on June 20, 1856.

Dean Davenport's death not only removes one of the oldest survivors of the pioneer era but a leader of outstanding accomplishments and national reputation. Although his active service to the land-grant institutions was not unusual as measured by length of days, few men have been more prominently identified with the advancement of agricultural education, research, and extension in this country.

One secret of Dean Davenport's popularity and influence with country people was his intimate knowledge of their life and problems. He was born in a log cabin which his pioneering father had built on 260 acres of Michigan boulder clay and timber land bought from the Government in 1853. He helped to clear this farm of timber and bring it into cultivation, and, after graduating in 1878 from the Michigan Agricultural College, where he shared in the labor system of its college farm, he returned to Woodland to spend the following 10 years. In 1888, however, he resumed further study at the college, served as assistant in botany under Dr. William J. Beal, and in 1889 was made professor of agriculture and farm superintendent. Here he functioned effectively as, to quote his own words, "the only college professor of agriculture in captivity who had spent 10 years after graduation in the actual, everyday work of the farm."

In 1891 he was selected by Senor Louis Quieroz, a wealthy citizen of Brazil desirous of establishing in the State of Minas Geraes what he called a "leettle Lansing," as the head of a projected agricultural college. After about a year of pioneer development, however, revolution broke out and Dr. Davenport returned to his Michigan farm.

Three years later he was appointed dean of the College of Agriculture of the University of Illinois and agriculturist of the station, and the following year was also made professor of thremmatology and director of the station. His major life work was carried on in these capacities during the ensuing 27 years. In 1921 he was also made for his remaining year vice president of the university.

When Dean Davenport began his work in Illinois there were but five students in agriculture and three members of the agricultural faculty. The experiment station was functioning somewhat more extensively, but its work was mainly confined to field experiments and its income was limited to farm receipts of about \$2,500 and the Hatch Act grant of \$15,000 per year. When he retired the undergraduate attendance in the College of Agriculture had grown to 1,200 students and the faculty comprised 175 members. The station income had reached \$135,353, of which \$310,394 was from State appropriations, and its staff numbered over 100. Comparable extension forces and facilities had also been obtained.

This phase of his work has been fittingly characterized by the present dean and director, Dr. H. P. Rusk, as follows: "He cast his lot with Illinois in 1895, when much of the richest farm land of the State was still covered with wild prairie grass, and by sheer weight of ability almost immediately assumed the agricultural leadership of this State. More than any other man, Dean Emeritus Davenport contributed to clear thinking and sound practice during the years when Illinois agriculture was passing from raw pioneer beginnings to procedures based on scientific information. To him is due the major credit for the closely knit and effective organization of the College of Agriculture, the experiment station, and the extension service in agriculture and home economics at the University of Illinois. As the administrative head of all agricultural activities at the university for more than a quarter of a century, he exercised rare judgment in the selection of men and women for positions on the staff, and then with unusual insight and patience gave every member of the staff his fullest confidence and untiring support. His broad knowledge of agriculture, his sound judgment, his unquestioned sincerity, and his fine human qualities made him a great leader who was admired and loved by all who knew him."

Outstanding as were the services of Dean Davenport to Illinois, his influence was not long, if ever, confined within the borders of a single State. He became early recognized as a representative and champion of the Middle West, and his views on such matters as the extension movement, agricultural cooperation, nature study, the development of secondary education in agriculture, and the preservation of institutional integrity soon commanded national attention. He became widely known as a writer on current agricultural topics and was the

author of numerous books, including *Principles of Breeding*, 1907; *Education for Efficiency*, 1909; *Domesticated Animals and Plants*, 1910; and *The Farm*, 1927. He was long a favorite speaker at other institutions in dedicatory exercises, commencements, and similar gatherings.

Notwithstanding his marked independence of thought and viewpoint, Dean Davenport was a man of wide contacts and a believer in the effectiveness of group action. Much of his success in Illinois came through his cordial relations with the farmers' institutes, the farm organizations of the State, and the system of advisory committees of breeders and other specialized interests which was developed. Nationally, he was a participant in the initial programs of the American Country Life Association, the National Research Council, and of Section O of the American Association for the Advancement of Science, becoming chairman of that section in 1916. Nor was his interest and enthusiasm restricted to new or popular undertakings, as is indicated by his loyal adherence to the Society for the Promotion of Agricultural Science and his acceptance of its presidency for two terms in 1911 and 1912.

Special mention should be made of his work in the organization now known as the Association of Land-Grant Colleges and Universities. This connection began with the Washington meeting of 1889 and continued unofficially far beyond his retirement as an ever-welcome visitor and participant in its programs. In the intervening years he had served as secretary of the college section and as a member of the committees on graduate study and the indexing of agricultural literature, the latter throughout its existence. Upon the formation of the committee of experiment station organization and policy in 1905 he became its chairman, serving continuously in this capacity until 1920 and thereafter as a member until his retirement. He was elected vice president of the association in 1904 and again in 1912, and in 1917 became one of the relatively few members not chief executives to be elected president.

Because of the World War, his presidential address was deferred until the Baltimore meeting of January 1919. Speaking less than 2 months after the armistice, Dean Davenport took for his title *Wanted: A National Policy*, and announced his purpose as "to invite attention to the very great need at the present time of a more definite policy regarding agriculture, a policy that shall be national in its scope, universal in its interests, and comprehensive in its procedures." Following a comprehensive discussion of the existing situation, he set forth as fundamentals of a national policy "fourteen points for agriculture." In brief these provided for subsidization of country schools to an extent sufficient to educate every child born on the farm to a stage admitting to college; recognition of the farmer as "a man-

aging operator of a small business of which the home and the family are integral parts" and entitled to "an income comparable with his labor, his investment, and his skill"; requirement by law of minimum housing conditions on rented farms; "the obligation not only to maintain but to increase the fertility of land, this obligation to be equally binding upon landlord and tenant and enforced by public license"; "elimination from the public mind of the idea that tenantry is to be regarded in America as typical land occupancy or as the ideal road to ownership"; public funds for financing young men in prospective ownership; interest rates on loans on land for home building based upon those of the most favorable bond issues; discouragement of speculation in land: "recognition of agriculture in all its phases as a matter of deep public concern, whether regarded as the machinery for the production of the food of the people or as the means of providing ideal conditions for the rearing of children"; and "finally, the determination to maintain upon the land the same class of people as are those who constitute the prevailing type among the mass of American citizens."

Much history has been made since these policies were proposed, including the advent of the "agricultural situation" of the twenties, the financial depression, and the renewal of hostilities abroad. Nevertheless, not a little which he advocated has come to pass in whole or in part, and other policies have received sympathetic consideration sufficient to justify for their author the appellation of a prophet. He was not, however, one of those prophets traditionally without honor in his own country. Michigan, Kentucky, Iowa, and Illinois in turn gave him advanced academic recognition in his lifetime. Many other States will join with these to pay tribute to his substantial accomplishments for agricultural education and research and the advancement of American country life.

RECENT WORK IN AGRICULTURAL SCIENCE

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

[Chemical investigations of the Bureau of Agricultural Chemistry and Engineering] (*U. S. Dept. Agr., Bur. Agr. Chem. and Engin. Rpt., 1940, pp. 2-63*).—The food research of this Bureau included work on vegetables and vegetable products; citrus-fruit and apple products; miscellaneous fruits and fruit products; cereals and seed products; eggs and egg products; enzyme, phytochemical, pharmacological, and microbiological investigations; plant viruses; animal viruses; and preserving biological specimens. Carbohydrate research covered sugarcane and cane sugar, beet sugar, farm-made sirups, honey, starches, and miscellaneous carbohydrates. Oil, fat, and wax investigations included determination of the number of tung-oil nuts necessary for estimating variations in quantity and quality of the oil due to variation in cultural conditions, improvements in the method for determining tung-oil content, studies on the solvent extraction of tung oil from press cake, work on the effects of cultural and environmental factors on content and quality of linseed oil, and work on South American palm kernel oil, Florida rubber-seed oil, and on the compositions of oils. Protein investigations included work on digestibility of soybean proteins, amino acids in oats, effects of storage on proteins of grains and seeds, and selenium in toxic plants. Allergen investigations dealt with cottonseed allergens and wheat allergens. Industrial farm-products research covered the subjects of hides and skins; tanning materials; leather; farm wastes; lignin; hemicelluloses; fermentation products; motor fuels; chemical products from oils, fats, and waxes; plastics; chemical weed killers; and soybeans and soybean products. Naval-stores research was concerned with the chemistry and technology of naval stores (turpentine and rosin) and production and processing of naval stores.

[Chemical work by the Texas Station] (*Texas Sta. Rpt. 1939, pp. 17, 161-163*).—Work by S. H. Wender on the isolation of the toxic principles of the locoweed, fig-products by H. M. Reed, and grape juice-blending by Reed and U. A. Randolph is noted briefly.

Influence of variety and treatment on phytin content of wheat, S. M. YOUNG and J. E. GREAVES. (*Utah Expt. Sta.*). (*Food Res., 5 (1940), No. 1, pp. 103-108*).—Thirty-two samples of wheat from the Nephi Dry-land Substation were analyzed for their phytin content by a method involving precipitation of the phytin from an acid extract of the grain by titration with ferric chloride in the presence of a suitable indicator. One group of samples represented 21 different varieties, all grown, harvested, threshed, and handled alike. Total phosphorus, as determined in these wheats at an earlier date (*E. S. R., 63, p. 108*), varied from 0.233 to 0.378 percent, while phytin phosphorus, as determined in the present study, varied from 0.132 to 0.323 percent. There was no particular relationship between total and phytin phosphorus, and calculations based on these two sets of figures indicated that phytin phosphorus represented from 52.3 to 94.3 percent of the total phosphorus in the various samples. Eleven samples of Kanred wheat grown under different conditions showed the phytin content to vary from 0.222 to 0.292 percent. On the basis of earlier determined values for

total phosphorus (0.278-0.366 percent), phytin phosphorus in these several samples represented from 70.0 to 93.0 percent of the total phosphorus.

A comparative study of the chemical composition of five varieties of soybeans, R. C. BURRELL and A. C. WOLFE. (Ohio State Univ.). (*Food Res.*, 5 (1940), No. 1, pp. 109-113).—Jogun, Bansel, and Kura, representative of better edible varieties of soybeans, and Illini and Peking, representative of varieties of inferior quality, were analyzed as mature beans by methods noted. The data for ash, fat, protein, crude fiber, reducing sugars, sucrose, raffinose, dextrins, starch, pentosan, galactans, calcium, magnesium, and phosphorus are presented by varieties. The three edible varieties were found to contain less fiber than the two field varieties, but no other important differences were indicated by the data reported.

The cystine content of eleven varieties of soybeans, T. S. HAMILTON and F. I. NAKAMURA. (Ill. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 3, pp. 207-214).—On the basis of the cystine determined in fat-free and carbohydrate-free extracts, averaging 96.2 percent of the total nitrogen, and expressed as a percentage of the whole soybean seed, the cystine content varied from 0.213 for Virginia beans to 0.553 for Mansoy beans. Expressed in milligrams of cystine per gram of nitrogen, a variation from 33.1 for the Virginia beans to 89.4 for the Mansoy variety was found.

Effect of protein concentration and cysteine on growth of halophilic bacteria, L. S. STUART. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 4, pp. 267-275, fig. 1).—The author shows that growth of halophilic bacteria at 3, 3.2, 3.5, and 3.8 M concentrations of sodium chloride is stimulated by increasing the concentration of protein. At a concentration of 4 M growth is not appreciably affected, but at 4.4, 4.5, 4.8, and 5 M, growth is inhibited as the concentration of protein increases. Increasing the concentration of protein in the substrate appears to offset the influence of unfavorably low pH when the sodium chloride concentration is not greater than 3.8 M.

The addition of small quantities of cysteine to agars and broths stimulates the growth of halophilic bacteria. There is a marked stimulation in media containing concentrations from 3 to 3.8 M sodium chloride at pH values ranging from about 6.6 to 7.2. With higher concentrations of sodium chloride the stimulating effect of cysteine is not so noticeable. The addition of cysteine to media also appears to offset the influence of unfavorably low pH.

The effects of protein concentration, sodium chloride concentration, and pH on the growth of halophilic organisms are markedly interdependent. At 3.2 and 3.8 M sodium chloride concentrations, increasing the protein concentration causes marked stimulation of growth when the pH is low, but only slight stimulation when it is high. However, when the concentration of sodium chloride is above 3.8 M, increasing the protein concentration tends to inhibit more strongly at the low pH than at the high.

The growth of halophilic bacteria in concentrations of sodium chloride above three molar, L. S. STUART. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 4, pp. 259-265).—Although pure sodium chloride yielded solutions of constant pH at all concentrations at which the measurement was made, commercial grades were found capable of becoming more acid or more alkaline with increase in concentration from 3 to 5 M. In contact with air the salt media for bacteria showed Eh values decreasing with increase in salt concentration in the range above mentioned, but when air was excluded the Eh values did not change with change in salt concentration. A stimulation of the growth of halophytic bacteria by salt concentrations above 3 M under aerobic conditions is considered attributable to the decrease in dissolved oxygen content, and the concomitant slight decrease in oxygen tension, thus indicated. Growth of

halophiles under atmospheres partially deprived of oxygen supported the indication that such bacteria may require a relatively low oxygen tension for optimum growth.

Studies on the mold mycelia count of butter. R. L. VANDAVEE and J. D. WILDMAN. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 3, pp. 693-709, figs. 10).—The presence and growth of molds in cream are associated with the development of decomposition flavor characteristics. There is a correlation between the mold mycelium content of butter and the acidity of cream churned, sweet cream or good sour cream producing a butter of a zero or a very low mycelium count, while butter made from high acid cream almost invariably has a high mold mycelium count. Such a count shows conclusively that decomposed or unfit cream was used.

[Selenium content of plants and soils] (*South Dakota Sta. Rpt. 1940, p. 15*).—Work by A. L. Moxon and O. E. Olson has shown the selenium content of grasses and most forage plants to decrease with growth of the plants, western wheatgrass (*Agropyron smithii*) absorbing more than do other common grasses, while gumplant (*Grindelia squarrosa*) often contains relatively large quantities of selenium and increases in selenium content with advancing growth. The same authors report on the forms of chemical combination in which selenium is held in converter plants, of which combination in proteins appeared one of the more important; and on the occurrence of arsenic, which acts to some degree as antidote to selenium poisoning, in seleniferous plants, the indications of this study being that, although more arsenic than selenium occurs in most of the rocks and soils examined, the plants contain much less of arsenic than of selenium.

Iodine in drinking waters, vegetables, cottonseed meal, and roughages. G. S. FRAPS and J. F. FUDGE (*Texas Sta. Bul. 595 (1940), pp. 25, fig. 1*).—Iodine was determined in nearly 500 samples of city and rural drinking waters, feeds (E. S. R., 83, p. 275), and feeding stuffs. The range in 103 samples of city waters was from 4 to 312 parts per billion, with an average of 56; in 37 samples of vegetables from 62 to 3,502 parts; in 235 samples of cottonseed meal from 23 to 1,420 parts; and in 56 samples of roughages and grasses from 17 to 1,125 parts per billion.

The use of iodized table salt for human consumption in Texas is considered not advisable, except under the supervision of a competent physician. Nor is the use of iodized mineral mixtures for livestock in Texas recommended.

The composition of certain nutshells. M. PHILLIPS and M. J. GOSS. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 3, pp. 662-665).—The percentage compositions of the following nutshells were determined: Almond (*Amygdalus communis*), Brazil nut (*Bertholletia excelsa*), candlenut (*Aleurites moluccana*), coconut (*Cocos nucifera*), English walnut (*Juglans regia*), filbert (*Corylus avellana*), and pecan (*Hicoria pccan*). The shells were ground to pass through a 60-mesh sieve, were dried at 105° C., and the following determinations were made: Ash; nitrogen; methoxyl; alcohol-benzene extractives, hot-water extractives, 1 percent hydrochloric acid extractives, and total extractives; uronic acid anhydrides; total furfural; pentosans; crude cellulose; furfural in crude cellulose; cellulose; and lignin, nitrogen in lignin, ash in lignin, and methoxyl in ash-free and in "pure" lignin. In general, the percentages of methoxyl in the lignin were higher than those usually found in lignified plant material. In the shells of the Brazil, candle, and pecan nuts, however, the percentages of lignin were unusually high, exceeding those of such highly lignified materials as woods, and in these instances of very high lignin content the percentage of methoxyl in the lignin was relatively low. High pentosan percentages usually accompanied low lignin contents, and high lignin contents were usually associated with low pentosan contents.

Thermal decomposition of undercured alfalfa hay in its relation to spontaneous ignition, E. J. HOFFMAN. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 4, pp. 241-257).—It is shown conclusively that heating undercured alfalfa in an atmosphere of nitrogen at approximately from 76° to 78° C. causes an increase in oxygen absorption, and that the oxygen consumed in the oxidation of the preheated alfalfa is far in excess of the carbon dioxide produced. Under the influence of heat supplied from external sources, with the exclusion of bacterial action, changes take place in alfalfa that render it more susceptible to oxidation, and the results give further indirect evidence of the formation of unsaturated substances in alfalfa hay by heat and chemical action without the intervention of micro-organisms.

"The conclusion appears to be fully warranted that in a haymow in which temperatures approximating those of the laboratory experiments have been reached as the result of respiratory and micro-organic processes, together with the more limited chemical reactions, the hay will undergo fundamental changes that will render it more susceptible to oxidation, and if this heat is sufficiently prolonged under favorable conditions the hay will reach a condition that may appropriately be called pyrophoric." The significance of the great increase in oxygen absorption caused by the presence of small quantities of ammonia is considered. The production of ammonia in the heating haymow, resulting in a weakly alkaline condition of the hay, is considered likely to facilitate the conversion of monosaccharides of the hay into unsaturated easily oxidizable compounds and thereby to promote spontaneous ignition.

The constitution of the so-called isocarotene [trans. title], P. KARRER and G. SCHWAB (*Helvetica Chim. Acta*, 23 (1940), No. 4, pp. 578-581).—Based on elementary analyses, the empirical formula for isocarotene is either $C_{40}H_{56}$ or $C_{40}H_{54}$. Structural formulas in accordance with known properties and reactions of the compound are formulated to correspond to these two empirical formulas. Evidence cited in favor of each of these structures is finally summarized as favoring the structure representing dehydro- β -carotene and associated with the formula $C_{40}H_{54}$.

Synthesis of 2-phytyl-1,4-naphthoquinone [trans. title], P. KARRER, A. GEIGER, A. RUEGGER, and G. SCHWAB (*Helvetica Chim. Acta*, 23 (1940), No. 4, pp. 585-590).—This paper presents the details of the experimental procedures involved in the synthesis of 2-phytyl-1,4-naphthoquinone. The scheme of the reactions employed and certain properties of the compound were noted in a preliminary report (E. S. R., 83, p. 735).

Another lower homolog of α -tocopherol [trans. title], P. KARRER and K. S. YAP (*Helvetica Chim. Acta*, 23 (1940), No. 4, pp. 581-584).—The synthesis is described of 2,5,7,8-tetramethyl-2-[12'-methoxy-pentyl]-6-oxy-chroman. This compound differs from α -tocopherol in having the long aliphatic side chain shortened by two isoprene residues. In 40-mg. doses this newly synthesized compound was completely devoid of vitamin E activity. The compound 2,5,7,8-tetramethyl-2-[4',8'-dimethyl-nonyl]-6-oxy-chroman, previously synthesized and differing from α -tocopherol by one less isoprene group in the long side chain, showed no vitamin E activity in 20-mg. doses.

[Reports of referees and associate referees on analytical methods] (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 3, pp. 445-658).—The following reports were contributed from the State and Federal institutions respectively noted: Carbohydrates in plants, by J. T. Sullivan (pp. 445-446), enzymes, by A. K. Balls (pp. 446-447), waters, brine, and salt, by A. E. Mix (pp. 447-451), butter, by J. A. Mathews (pp. 458-463), fat in malted milk, by E. W. Coulter (pp. 465-467), lactic acid in dried skim milk, by F. Hillig (p. 467), mold in butter, by J. D. Wildman (p. 468), neutralizers in dairy products, by F. Hillig (pp. 468-469), cereals, by V. E.

Munsey (pp. 477-480), ash in flour, macaroni products, and baked products, by L. H. Bailey (pp. 480-482), fat acidity in grain, by L. Zeleny (pp. 492-496), flour-bleaching chemicals, by D. B. Scott (pp. 497-502), ergot in flour, by L. C. Miller (pp. 504-505), standard solutions, by R. L. Vandaveer (pp. 540-542), standardization of sulfuric acid, by W. H. King (pp. 542-543), standardization of potassium permanganate solutions, by G. M. Johnson (pp. 543-546), pyrethrum, derris, and cube, by J. J. T. Graham (pp. 551-556); naphthalene in poultry lice products, by R. Jenkins (pp. 556-557), disinfectants, by C. M. Brewer (pp. 557-558), ash in molasses, by R. A. Osborn (pp. 567-572), flavors and nonalcoholic beverages, by J. B. Wilson (pp. 572-576), organic solvents in flavors, by R. D. Stanley (pp. 576-577), meat and meat products, by R. H. Kerr (pp. 577-578), spices and other condiments, by S. Alfend (pp. 578-586), vinegars, by A. M. Henry (pp. 586-588), fish and other marine products, by H. D. Grigsby (pp. 589-593), cacao products, by W. O. Winkler (p. 593-596), gums in foods, by F. L. Hart (pp. 597-603), oils, fats, and waxes, by G. S. Jamieson (pp. 603-604), nuts and nut products, by S. C. Rowe (p. 605), microbiological methods, by A. C. Hunter (pp. 606-607), frozen egg products, by R. Schneider (pp. 613-617), biological methods for determination of vitamin D carriers, by C. D. Tolle (pp. 648-652), and biological methods for components of the vitamin B complex, by O. L. Kline (pp. 653-654) (all U. S. D. A.); dairy products, by G. G. Frary (pp. 451-453); total solids and ash in milk and evaporated milk, by G. G. Frary and B. Jordan (pp. 453-457); tests for pasteurization of butter, by E. H. Parfitt (pp. 469-470) (Purdue Univ.); sugar in flour, by R. M. Sandstedt (pp. 496-497) (Univ. Nebr.); whole wheat flour, by C. S. Ladd (pp. 508-512); sugars and sugar products, by R. F. Jackson (pp. 558-560); maple products, by J. L. Perlman (pp. 560-562); salad dressings, by L. T. Ryan (p. 559); coffee and tea, by H. J. Fisher (pp. 605-606) (Conn. [New Haven] Expt. Sta.); feeding stuffs (p. 617) and need of a method for determination of castorseed in feeding stuffs (pp. 618-619), both by L. S. Walker (Vt. Sta.); sampling feeding stuffs, by L. M. Jeffers (pp. 619-620); ash in feeding stuffs, by J. L. St. John (pp. 620-636) (Wash. Sta.); mineral mixed feeds, by A. T. Perkins and B. W. Beadle (pp. 637-640) (Kans. Sta.); manganese in stock feeds, by J. B. Smith and E. J. Deszyck (pp. 654-656) (R. I. Sta.); and adulteration of condensed milk products and cod-liver oil, by P. B. Curtis (pp. 656-658) (Purdue Univ.).

The Shaffer-Somogyi reagent for the determination of sugars in plant materials, T. A. PICKERT. (Ga. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 2, pp. 431-437, fig. 1).—Results obtained with the copper iodometric method for fermentable sugars agreed fairly closely with reducing sugar values obtained by the Official method of Quisumbing and Thomas. In determinations of sucrose the two methods agreed closely. The copper iodometric reagent was found to be economical, rapid, and applicable to materials of low sugar content, all these characteristics being of value in the determination of sugars in plant material.

Thorium nitrate titration of micro quantities of fluorine in aqueous and alcoholic systems, J. W. HAMMOND and W. H. MACINTYRE. (Tenn. Expt. Sta. et al.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 2, pp. 398-404, figs. 2).—The authors present results indicating that microquantities of fluorine cannot be determined accurately in aqueous systems by application of the normality value of a thorium nitrate solution. Were normality value applied for the 2-50- μ g. range in the aqueous systems adjusted with hydrochloric acid, the mean apparent incidence would be 1.5 times the true value. Similar application of normality value for microgram range in the buffered aqueous systems would give a medial apparent indication 2.05 times the true medial. For such microgram range, titration value of a thorium nitrate solution must be de-

terminated empirically against corresponding quantities of fluorine from a material of known assay and for the specific solvent, definite volume, and identical quantity of indicator. When titrations are made in alcoholic solution, however, application of the stoichiometrical value of the standard thorium nitrate will give accurate values in a solution of adjusted pH and without inclusion of a buffer solution.

Quantitative spectroscopic analyses of important trace elements in mixed fertilizers, E. H. MELVIN, R. T. O'CONNOR, O. R. WULF, and C. H. KUNSMAN. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 2, pp. 282, 283).—The authors determined boron, copper, and manganese simultaneously by a spectroscopic method in which standards and samples were prepared for analysis by the addition of 0.05 percent of beryllium which served as an internal reference element. The importance, for direct current arc excitation, of burning the sample completely is among the points brought out.

Estimation of decomposition of fish muscle, H. C. BRADLEY and B. E. BAILEY. (Univ. Wis.). (*Food Res.*, 5 (1940), No. 5, pp. 487-493, fig. 1).—The phosphomolybdate color test for tyrosine was found sufficiently sensitive to permit detection of the beginning of spoilage before taste or odor or spoilage could be noted. A sample consisting of 20 gm. of the fish product was extracted for 30 min. or more with 50 cc. of water. Of the resulting suspension 10 cc. were diluted with 10 cc. of water and treated with 20 cc. of 10 percent trichloroacetic acid. After 3 hr. the precipitated protein was filtered out and the filtrate (from 1 to 10 cc.) was treated with 15 percent sodium carbonate (20 cc.) and 5 cc. of the tyrosine reagent, the volume being completed to 50 cc. Comparison was made in a colorimeter with standards containing known quantities of tyrosine.

On the use of various sera for the determination of the soluble calcium and phosphorus in milk, G. T. PAYNE (*Jour. Dairy Res. [London]*, 11 (1940), No. 3, pp. 292-297).—The sera examined in this study included milk dialysate in the static form, rennet whey, papain whey, and mercuric chloride borax serum. Rennet whey was the most satisfactory and yielded fairly accurate values for calcium, but slightly low values for phosphate in fresh milk. With increasing acidity of the milk both sets of values tended to rise somewhat in comparison to those of the dialysate. Mercuric chloride borax serum gave higher results for soluble phosphate in fresh milk, while with increasing acidity the results dropped steadily. Papain whey gave somewhat low results for both the phosphate and calcium of raw and pasteurized milk, and exhibited the same tendency as rennet whey to yield higher results as the acidity of the milk increased.

A comparator for the resazurin test, J. G. DAVIS and S. B. THOMAS (*Dairy Indus.*, 5 (1940), No. 9, pp. 244-246, figs. 2).—Two types of Lovibond color comparators are described and illustrated. The data presented indicate that finer color distinction is possible through use of the comparator than by simple color grading. Good agreement of results were obtained by two or more observers.

Ash determinations in foods with an alkaline balance, [1], H. J. WICHMANN. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 3, pp. 680-687, fig. 1).—The author studied various sources of discrepancy in the results of ash determinations. Turned covers of duralumin were made to fit platinum dishes and were shown to prevent absorption of moisture by the ash even in a very moist atmosphere. Heating a sulfated ash to constant weight required as much time as obtaining consistent results in the determination of true ash, and the author also considers that a sulfated ash differs too much from a normal ash. In the determination of ash as carbonated ash, the temperature for the reheating after adding ammonium carbonate was reduced to 260° C. ($\pm 10^\circ$) because higher temperatures appeared to bring about a slow decomposition of the carbonates. Variations in temperature in various parts of the crucible

space of the muffle furnace are held responsible for some discrepancies. Such differences in temperature may be lessened by placing the ashing dishes on a silica plate supported above the floor of the muffle.

Interpretation of a new method for the detection of bleaching of flour with chlorine, D. B. SCOTT. (U. S. D. A.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 3, pp. 675-678).—The author made some minor modifications in the procedure in accordance with the observations of collaborators, determined the chlorine content of a number of bleached and unbleached flours, compared these results with those of some other analysts, and concluded that a chlorine content in the extracted fat amounting to more than 0.25 mg. per gram definitely indicates treatment with chlorine bleaching compounds. The average chlorine content of the 28 authentic samples was 0.11 mg. per gram of fat.

Copper in tomatoes, W. J. SHANNON and D. T. ENGLIS. (Univ. Ill.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 3, pp. 678-680).—To obtain a basis for the detection of copper from processing equipment or from other sources exclusive of the natural copper content of the unprocessed material, four varieties of tomatoes were subjected to oxidation with nitric and perchloric acids, the copper content being estimated by means of the diethyldithiocarbamate color reaction with the use of a photoelectric colorimeter. The copper content of the material analyzed varied from 15 to 25 p. p. m., approximately.

Determination of chlorides in feeding stuffs, G. E. GRATTAN and A. POTVIN (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 2, pp. 425-428).—The authors found ordinary ashing to cause a loss of chlorides both by direct volatilization and by formation of hydrochloric acid through the action of nonvolatile acid oxides on the chlorides. Adding oxides of alkaline-earth metals necessitated making blank determinations. These difficulties were overcome by ashing at 550° C. in the presence of sodium carbonate. This method gave satisfactory results but was time consuming and tedious. A second method was then developed, the organic matter being destroyed by oxidation with potassium permanganate solution. Such oxidation could be completed by boiling for about 10 min. The excess permanganate was decomposed by hydrogen peroxide. The chloride content was finally determined, in either method, by titration with silver nitrate solution.

Determination of carotene in presence of lycopene, G. S. FRAPS, A. R. KEMMERER, and S. M. GREENBERG. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 2, pp. 422-425).—Magnesium carbonate, prepared by heating for 1 hr. at 200° C. and, when necessary, adjusted with respect to its moisture content after cooling, was found to adsorb lycopene without adsorbing carotene. This reagent, tested in the process of adjusting its moisture content by means of a lycopene solution prepared from canned tomato pulp, was found to remove much more lycopene from carotene solutions than did a similar magnesium carbonate reagent standardized for adsorption of crude xanthophyll prepared from alfalfa-leaf meal.

An adsorption method for the determination of pure carotene, G. S. FRAPS, A. R. KEMMERER, and S. M. GREENBERG. (Tex. Expt. Sta.). (*Jour. Assoc. Off. Agr. Chem.*, 23 (1940), No. 3, pp. 659-662).—The modified A. O. A. C. method, in which the carotene in petroleum ether solution is purified by shaking with an adsorbent to remove impurities, is shortened by adsorbing the xanthophyll and impurities directly, instead of first washing with methyl alcohol and then using the adsorbent. Comparisons of the results obtained in determinations on 19 samples indicated that the shorter adsorption method gives the same results for pure carotene as does the longer modified A. O. A. C. method.

Chromatographic identification and biological evaluation of carotene from mature soybeans, W. C. SHERMAN. (Ala. Polytech. Inst.). (*Food Res.*, 5 (1940), No. 1, pp. 13-22).—Pigments were removed from the ground soybeans

by successive extraction with methanol, ethanol, and skellysolve. Following saponification of the combined extracts, the method of Sherman and Salmon (E. S. R., 83, p. 130) was employed for removal of the xanthophyll and purification of the carotene solution. The purified extract, concentrated to small volume under reduced pressure and taken up in skellysolve, was subjected to chromatographic analysis applied on a microscale. The solution was poured through a small Tswett column packed with an intimate mixture of magnesium oxide and heated siliceous earth. The bands of pigment, usually three in number, were separated, and the pigment was completely removed from each adsorbent layer by appropriate washing. The final solutions were made up to suitable volumes in which the pigment content was determined by calculation based on spectrophotometer readings at 475 m μ . Identification of the pigment obtained from each band was established by chromatographic analyses of a mixture of the unknown with a known pigment, α - and β -carotene and cryptoxanthin being used as the pigments for identification. Results obtained with five varieties (F. P. I. Nos. 858S4, 93057, and 94168, Matthews, and Kura) of soybeans showed that the total pigment content ranged from 92 γ to 174 γ per 100 gm. and that from 80 to 88.8 percent of it was β -carotene, while from 2.5 to 11.8 percent was α -carotene. Cryptoxanthin was not found. These results were confirmed by biological assays in which the soybeans, fed on an equivalent carotene basis (2 γ daily) to vitamin A-deficient rats, gave growth responses similar to those obtained from 2 γ of β -carotene. Yellow corn fed as a control at a level to supply 2 γ of pigment produced a smaller weight gain than did the soybeans, since 66 percent of the corn pigment, as shown by chromatographic analysis, was cryptoxanthin.

A chemical study of juice from Concord grapes, C. F. POE (*Fruit Prod. Jour. and Amer. Vinegar Indus.*, 19 (1940), No. 6, pp. 175-178).—Data on total and sugar-free solids; ash; total, volatile, and fixed acids; and reducing sugars, together with values for specific gravity, alkalinity of the ash, and ratios of sugar to acid and of sugar-free solids to ash are reported for 54 samples of Concord grape juices from grapes of the seasons of 1933, 1934, 1935, and 1937, respectively. The grapes, purchased on the open market, represented fruit grown in Nebraska, Missouri, Arkansas, Michigan, Colorado, and Kansas. The juices, expressed hot from washed (adhering water removed) crushed grapes, were filtered and sterilized and stored under refrigeration until analyzed. Similar data are given for a few samples each of juices from Niagara, Delaware, and white grapes. Not only were there seasonal variations in average composition, but within any given season different samples varied widely in composition. It is considered, therefore, that the determination of most of the constituents would be of little value for the purpose of judging the purity in cases of minor adulterations.

Chemical and physical characteristics of the petroleum ether soluble material of fresh and canned Florida Valencia orange juice, A. J. NOLTE and H. W. VON LOESECKE. (U. S. D. A.). (*Food Res.*, 5 (1940), No. 5, pp. 457-467, fig. 1).—From fresh juice the authors obtained unidentified waxy bodies insoluble in petroleum ether; oleic, linoleic, cerotic, palmitic, and stearic acids; unidentified aliphatic alcohols and resins; phytosterols; sterols; and carotenoid pigments. The characteristics of the petroleum ether extract of aged canned orange juice indicated that the fatty material had undergone oxidative changes, with the formation of hydroxy acids and other decomposition products, and had become rancid. It is believed that off-flavors subsequently developing in canned orange juice are, to some extent, due to the oxidation of the fat in the juice.

Citrus fruit products, EL. M. CHACE, H. W. VON LOESECKE, and J. L. HEID (U. S. Dept. Agr. Cir. 577 (1940), pp. 47, figs. 14).—This circular, which superseded Department Circular 232 (E. S. R., 48, p. 13), describes present commercial

manufacturing methods for products from cull and surplus citrus fruit. Processes for the production of canned and frozen juices, canned segments, vinegar, beverage bases, alcoholic beverages, citric acid, pectin, essential oils, candied peel, marmalade, and jellies are described. Home-use recipes for the last three products are included. The final section takes up disposal of the wastes from citrus canneries and other byproduct plants.

Some factors in the spoilage of an acid canned fruit, C. H. SPIEGELBERG. (Hawaii. Pineapple Prod. Expt. Sta.). (*Food Res.*, 5 (1940), No. 5, pp. 439-455, figs. 3).—Factors involved in the spoilage of an acid canned fruit caused by both spore-forming (*Clostridium pasteurianum*) and non-spore-forming (*Lactobacillus plantarum*, *Leuconostoc mesenteroides*) and three unnamed types of bacteria are discussed. Commercial processes were found effective when fruit of average pH was packed with commercial pineapple-juice sirups. Swells developed only when the time or temperature of processing was greatly reduced from the standard. When the pH of the can contents was increased either by adjusting the pH of the sirup or by selecting high pH fruits and packing them with unadjusted commercial sirups, however, pH was found a factor of considerable importance in sterilization. A low pH juice sirup was more effective in producing sterility than a high pH juice sirup. Unbuffered water sirup was more effective than naturally buffered juice sirup. At a pH of from 4.4 to 4.5 and below, a temperature of 87.8° C. (190°F.) in the fruit leaving the cooker was adequate to insure sterility, but at pH 4.5 and above a temperature of 93.3° C. was required to eliminate the non-spore-forming types of swells, while butyric swells persisted with even much higher temperatures. It is considered that spoilage may be avoided by maintaining the final pH of cans at or below 4.4 and processing to give a temperature of 190° F. or above in the fruit from the cooker.

200 tell what they prefer in pickle sweeteners, R. G. SWITZER and F. W. FABIAN. (Mich. Expt. Sta.). (*Food Indus.*, 12 (1940), No. 11, pp. 38-40, fig. 1).—Four series of pickles were prepared, in which sugar at 37° and at 33° Brix (20.3° and 18.2° Baumé, respectively) and acid, as acetic, at 2.0 and 2.28 percent (20 and 22.8 gr., respectively) were the variables. In all experiments three combinations of sugar were used, namely, 100 percent sucrose, 75 percent sucrose plus 25 percent dextrose, and 50 percent sucrose plus 50 percent dextrose. Samples of the 12 products resulting were sent to 40 different pickle companies and food laboratories where about 200 people scored the products, according to definite instructions, for flavor and general palatability. Analysis of the scores indicated that the tasters were more sensitive to slight increases in acidity than to slight reductions in sweetness, and that within practical limits there should be for every grain increase or decrease in acetic acid a corresponding increase or decrease of 1° Baumé. The best combination of sucrose and dextrose in a 20° sirup at 20 gr. acidity was 75 percent sucrose and 25 percent dextrose. Increasing the acidity to 22.8 gr. in either the 18° or the 20° sirup or reducing the sugar concentration to 18° at 20 gr. acidity decreased the number of first choices in the sucrose-dextrose combination as compared with sucrose alone.

[Jerusalem artichoke as raw material for fermentation lactic acid] (*Utah Sta. Bul.* 294 (1940), pp. 12, 41).—This report notes briefly the possibility of producing a fermentable material at a cost less than that of corn or blackstrap molasses, the development of a fermentation method utilizing a *Bacillus* species, and the elaboration of an hydrolysis process satisfactory for breaking down the inulin content of the tubers into fermentable units.

Turpentine still buildings and equipment (*U. S. Dept. Agr., Misc. Pub.* 387 (1940), pp. [2]+44, figs. 35).—This publication contains specifications, working drawings, and bills of materials for still buildings including ramp, for a copper

fire still for turpentine, and for a still worm to be attached to this still. Directions for setting the fire still are given in addition to the drawings. Condenser tub, separators, dehydrators, rosin vats, and a cooper's winch are also taken up. Working drawings for these accessories are included.

AGRICULTURAL METEOROLOGY

Report of the Chief of the Weather Bureau, 1940, F. W. REICHELDERFER (*U. S. Dept. Agr., Weather Bur. Rpt., 1940, pp. 16*).—This report discusses the reorganization of the Central Office; outlines the work of the weather service for civil airways, the forecasting and warning services, the river and flood service, and climate and crop service; briefly summarizes the weather of 1940; describes the instrument equipment of the Bureau; briefly reviews the progress in meteorological research and education; and notes the Bankhead-Jones projects conducted by the Bureau during 1940.

Climatological data for the United States by sections, [January–June 1940] (*U. S. Dept. Agr., Weather Bur. Climat. Data, 27 (1940), Nos. 1–6, [about 220 pp., 2 pls., 8 figs. each]*).—These numbers contain the usual brief summaries and detailed tabular statements of climatological data for each State.

Climates, climax, and vegetational strata [trans. title], H. GAUSSEN (*Bol. Soc. Broteriana, 2. ser., 13 (1938–39), pp. 29–40*).—A discussion of the relations of climate and climax to plant associations at different elevations.

In how far does the farmer consider the climatic factor? [trans. title], P. LEHMANN (*Bioklim. Beibl. Met. Ztschr., 7 (1940), No. 3, pp. 77–85*).—A general discussion and review (27 references).

Fog: Its causes and forecasting with special reference to eastern and southern United States, I–III, J. J. GEORGE (*Amer. Met. Soc. Bul., 21 (1940), Nos. 4, pp. 135–148, figs. 5; 6, pp. 261–269, figs. 5; 7, pp. 285–291, figs. 5*).—In part 1 the author discusses the conditions necessary for fog, and presents a new classification of fogs and a procedure for forecasting them. In part 2 he presents the results of quantitative studies of fog causes and forecasting at Atlanta, Ga., Camden, N. J., Richmond, Va., and Louisville, Ky., and in part 3, at Jacksonville, Fla., San Antonio, Tex., and New Orleans, La.

Temperature in the hothouse [trans. title], K. WEGENER (*Bioklim. Beibl. Met. Ztschr., 7 (1940), No. 3, pp. 109–112, figs. 3*).—A general discussion of temperature relations and control in greenhouses.

SOILS—FERTILIZERS

[Soil and fertilizer investigations of the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1940, pp. 12–13, 27–35*).—Fertilizer researches given in this report include investigations on the domestic source of magnesium in fertilizers, production of dicalcium phosphate from phosphate rock, granulation of superphosphate, and methods of decreasing the caking tendency of hygroscopic fertilizer materials.

Soil chemistry and physics investigations included characteristics of various soil groups, minor elements in soils and vegetation, a study of rapid soil tests in comparison with laboratory methods, and the relation of thermal conductivity and moisture content of soils.

Soil-fertility investigations are reported on the use of leaf symptoms to show soil deficiencies, improvement of soil fertility in relation to pecan yield, fertilizers for strawberry growing, fertilizer studies on southern truck crops and cotton soils, relation of fertilizer and plant composition to cotton root rot, the effect of nitrogen fertilizers on sugar beet yields, domestic in comparison with foreign potash for potatoes, and fertilizer studies on certified seed potatoes.

Soil-microbiology investigations included data from a study of bacteriophages found in soils, a test of legume inoculants, and soil micropopulation in relation to control of root diseases.

Soil survey progress includes improvement of methods and a list of surveys made and published.

[Soil investigations by the New Jersey Stations] (*New Jersey Sta. Rpt. 1940, pp. 80-85, fig. 1*).—Lysimeter studies, quick soil tests, soil-profile investigations, land use in relation to soil fertility, soil-nitrogen relations, action of green manure, phosphorus fixation, dolomitic v. high-calcium lime, use of lime, the effect of boron on plant growth, the need of New Jersey soils for boron, oxygen tension in relation to root growth, organic matter and surface mulch for erosion control, the role of soil microbes in erosion control, nitrogen fixation, commercial use of soil microbes, microbial antagonism, and the role of actinomycetes in the soil are briefly reported.

[Soil investigations by the Cornell Station] ([*New York*] *Cornell Sta. Rpt. 1940, pp. 92-94, 95-96*).—Progress is reported on investigations of the oxidation-reduction phenomena in soils in relation to the availability of certain minor elements by R. W. Cummings and R. Bradfield; phosphorus fixation for three New York soils by E. V. Staker and Bradfield; the effect of soil type upon the growth of black locust plantations and the relation of soil character to forest growth in the Adirondack region by R. F. Chandler, Jr.; and zinc toxicity in peat soils by B. D. Wilson and Cummings.

[Soil investigations by the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt. 1939-40, pp. 38-45, 46-48, 52, figs. 4*).—Reports are made of progress on cooperative experiments with individual farmers of the State to serve as a basis for recommending various agronomic practices, the average plant nutrient content and soil reaction of 13 soil areas, the effect of soil pore space on plant growth, the loss of sulfur from Oklahoma soils, and cotton burs as a fertilizer for cotton.

[Soil investigations by the South Dakota Station] (*South Dakota Sta. Rpt. 1940, pp. 5, 6, fig. 1*).—Research by L. F. Puhr on the effect of cropping practices on soil organic matter and nitrogen and the difference in rate of decomposition of crop residues in the soil is reported.

[Soil investigations by the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1939, pp. 16, 95-98, 211-212, 264-266*).—Investigations include a greenhouse study of factors of soil fertility, by G. S. Fraps, J. F. Fudge, and P. F. Macy, and nitrification in soils under different conditions, by A. J. Stergea. The status of a soil survey for Brown County is reported by E. H. Templin et al.; for Cherokee County, by H. M. Smith et al.; for McLennan County, by Templin et al.; and for Uvalde County, by W. I. Watkins and W. T. Carter. Soil investigations reported from the Nacogdoches Substation include results of preliminary studies of artificial plats for field experiments, and green-manure investigations both by H. F. Morris. Soil investigations at the Weslaco Substation include progress on the acid sulfur composts, comparisons between sulfur and sulfur compost in the rate of acid development in soils, the effects of various acidifying chemicals and fertilizers on soil pH, and diffusion of acidity outward from spot and trench applications of sulfur, all by G. H. Godfrey and H. Rich.

[Soil investigations by the Utah Station] (*Utah Sta. Bul. 294 (1940), pp. 45-51, figs. 2*).—Progress is reported on the studies of the loss of nitrogen and organic matter from dry lands, physical and chemical studies of soil types, factors affecting the activities of bacteria in soils, the effect of various fertilizers on crop yields, and the effect of different fertilizer treatments on the quantity and distribution of different elements in beets.

[Soil investigations by the West Virginia Station]. (Partly coop. U. S. D. A.). (*West Virginia Sta. Bul. 298 (1940), pp. 4, 7*).—F. W. Schaller and

G. G. Pohlman report the effect of soil management on pasture returns. Root growth of deep-rooted plants in limestone soils is reported on by Pohlman, T. C. McIlvaine, and W. M. Broadfoot.

Report of the Chief of the Soil Conservation Service, 1940, H. H. BENNETT (*U. S. Dept. Agr., Soil Conserv. Serv. Rpt., 1940, pp. 64*).—The cost and extent of erosion in the United States, and the accomplishments for better protection and use of the land under soil conservation practices are reported. Action research, the economic aspects of soil conservation for the various regions, development of soil conservation districts, land-use capabilities, and outstanding findings at the soil conservation experiment stations are briefly reported. Engineering phases of this report are noted on page 823.

Soil conservation achieved by the AAA program, F. L. MORISON (*Ohio Sta. Bimo. Bul. 208 (1941), pp. 11-12*).—Percentages of increase in soil-conserving crops and of decrease in soil-depleting crops and related information for the period from 1937 to 1940 are summarized and briefly discussed.

Erosion and related land use conditions (*U. S. Dept. Agr., Soil Conserv. Serv., Erosion Survey 12 (1940), pp. [1]+25, pls. 3, figs. 2, maps 2; 13, pp. [1]+31, pls. 5, fig. 1, maps 2; 14, pp. [1]+23, pls. 3, fig. 1, maps 2; 16, pp. [1]+35, figs. 13, maps 2*).—Conservation surveys are reported as follows: Hell and Mud Creeks Demonstration Project, Mississippi, by D. T. Webb; Mad River Watershed, Vermont, by C. H. Atkinson; Lake Crook Watershed, Lamar County, Texas, by H. Oakes; and Crooked Creek Project, Near Indiana, Pa., by J. G. Steele and R. G. Mowrey.

The story of soil conservation in the South Carolina Piedmont, 1800-1860, A. R. HALL (*U. S. Dept. Agr., Misc. Pub. 407 (1940), pp. [1]+36, figs. 9*).—This publication is a historical review dealing with some early efforts to stop the depletion and destruction of land by continuous cotton growing and by alternating corn and cotton crops.

[Soil erosion investigations by the West Virginia Station] (*West Virginia Sta. Bul. 298 (1940), pp. 5-7*).—A study of the slipping of soils is briefly reported upon by S. L. Galpin, and the rebuilding of eroded soils by G. G. Pohlman, W. M. Broadfoot, W. C. Percival, T. Holsoe, and G. M. Browning.

Factors affecting aggregation of Cecil soils and effect of aggregation on run-off and erosion, J. ELSON and J. F. LUTZ. (*N. C. Expt. Sta. coop. U. S. D. A.). (Soil Sci., 50 (1940), No. 4, pp. 265-275*).—Soils from several plats of the U. S. D. A. Soil Conservation Field Station and from the Piedmont Substation, both at Statesville, were studied in an attempt to find the relationship between chemical and physical soil properties and erosion. Results are reported on aggregate analysis, organic carbon, changeable hydrogen, total exchange capacity, percentage of sesquioxides, and pH. Aggregation was highest and erosion less on plats where a 4-yr. rotation, including lespedeza, was grown. An area in continuous grass for 7 yr., but which was declining toward the end of the period, was almost as effective as the 4-yr. rotation in aggregating the topsoil but was less effective in the subsurface soil due to the shallow-rooted character of the grass cover. Continuous cotton had the lowest percentage of aggregation in both the topsoil and subsurface soil, and decrease in aggregation with a reduction in the free iron oxide content of the soil due to superphosphate fertilization is discussed. Aggregation of Cecil clay was decreased by liming. The condition of the humus was found to be more important than the total organic matter present in bringing about aggregation.

Field tests on the effectiveness of trashy fallow and contour seeding in controlling erosion, J. H. PARKINS (*Northwest Sci., 14 (1940), No. 4, pp. 88-89*).—Field tests by the U. S. D. A. Soil Conservation Service in Oregon demonstrated the effectiveness of trashy fallow and contour fallow in controlling erosion

in connection with wheat production. Comparisons are reported for four fields of approximately 10 percent slope on Walla Walla silt loam. Different tillage was used in each field, and varying amounts of straw were left on the surface. Soil loss was estimated by measuring the length and cross section of the rills formed. These field trials indicate that contour seeding and trashy fallow appear to be of nearly equal effectiveness.

The base binding capacities of hydrogen clays as determined by different methods, I. R. P. and A. K. MITRA (*Indian Jour. Agr. Sci.*, 10 (1940), No. 3, pp. 344-351).—Total acidities of colloidal solutions of hydrogen clays calculated from their electrometric titration curves have been compared with their base-binding capacities obtained by other methods.

Relationship between organic matter content and moisture constants of soils, J. T. STONE and C. S. GARRISON. (Mich. Expt. Sta.). (*Soil Sci.*, 50 (1940), No. 4, pp. 253-256).—Soil samples from Michigan fence lines, which have been in sod cover perhaps since the land was cleared, were compared with samples obtained from adjoining cultivated fields. Hygroscopic-moisture, moisture-equivalent, wilting-coefficient, and organic-matter-content determinations were made for several different soil types to establish any relationship between organic-matter content and moisture condition. In all but one case the organic-matter content of the soil collected from the sod areas was higher than that from the adjoining field. A direct correlation was obtained between organic-matter content of the soils and their available moisture.

The use of soil moisture characteristics in soil studies, E. C. CHILDS (*Soil Sci.*, 50 (1940), No. 4, pp. 239-252, figs. 6).—The use of "soil-moisture characteristic curve" is demonstrated by applying it to the study of soil tilth and soil stability. Soil-moisture characteristics are assumed to indicate pore size distribution in certain cases. The author brings out, in a discussion of pore space in a clay fraction and in a sand fraction, that the use of the terms "capillary or noncapillary pore space" is misleading, since they imply a knowledge of the physical properties of the pores which is not known. A numerical value as a definition of soil stability is developed.

Effect of exchange sodium on the moisture equivalent and the wilting coefficient of soils, F. M. EATON and C. R. HORTON. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 6, pp. 401-425, figs. 3).—The average moisture equivalents of 12 well-leached Ca, Mg, K, and Na soils were Ca 17.9, Mg 18.1, K 18.8, and Na 33.8. The average moisture uptake by these soils when exposed (after oven drying) in an atmosphere with a relative humidity of 84 percent at 20.3° C. was K 2.66, Na 3.09, Ca 3.26, and Mg 3.38 percent. A close parallelism was found for 10 soils between the effect of sodium on the moisture equivalent and the percentage of clay, the exchange capacity, and the quantity of adsorbed sodium.

Adsorbed sodium decreased the moisture equivalent of a soil high in silica and that of an Aiken (lateritic) clay. Both of these soils had low cation exchange capacities. The moisture in centrifuged Ca soil samples increased from the inner toward the outer surfaces. An opposite gradient was found in Na soils. Some migration and segregation of sand, silt, and clay particles occurred when the finer-textured Na soils were centrifuged, a higher proportion of large particles being observed in the outer portions with well-defined clay layers on the inner surface. In certain of the soils water was also displaced toward the axis of rotation and remained on the surface after centrifuging.

Wetting Na soils with normal calcium or sodium chloride solutions gave moisture equivalent values that were nearly the same as those of Ca soils. The moisture equivalent may, therefore, provide a measure of sodium-induced dispersion of field soils if comparisons are made between leached and unleached

soils and soils wetted with a strong electrolyte. The moisture equivalent of mixtures of Ca and Na soils in successive proportions gave sigmoid graphs. The moisture equivalent was not significantly affected by less than 2 milliequivalents of adsorbed sodium per 100 gm. of soil, and values approaching maximum were found when there were 12 m. e. or more of adsorbed sodium. Adsorbed sodium caused soil moisture to be less available to plants.

The calcium and sodium averages of 9 soils were at the moisture equivalent 17.5 and 29.5, at the wilting coefficient 8.4 and 11.3, and at the ultimate wilting point 7.8 and 9.2, respectively. Plotted as moisture content against a pF scale, the Ca and Na soil graphs intersected at moisture percentages below the ultimate wilting point.

Studies on soil temperatures in relation to other factors controlling the disposal of solar radiation, R. K. DRAVID (*Indian Jour. Agr. Sci.*, 10 (1940), No. 3, pp. 352-387, figs. 5).—Experiments showed the sensitivity of soil temperatures to changes of color or surface wetness, and the thermal diffusivity is not influenced by the surface treatments but increases when the moisture content of the interior of the soil is increased during the wet season.

A comparison of the organic matter of uncultivated and cultivated Appalachian upland Podsol soils, H. F. SALISBURY and W. A. DELONG (*Sci. Agr.*, 21 (1940), No. 3, pp. 121-132).—Appalachian upland Podzol soils from forested, cultivated, and pastured areas have been studied to determine the amount and nature of the organic matter in the plow-depth layer. After about 75 yr. of deforestation the cultivated and pastured soils were found to be somewhat lower in organic matter than the forested soils. The hemicellulose and lignin content for the forested soils is higher than that for the cultivated or pastured soils.

The pedography of hydrologic Podzol series, I, II (*Lantbr. Högsk. Ann. [Uppsala]*, 7 (1939), pp. 185-227, figs. 11, *Siced. abs.* pp. 226-227; 8 (1940), pp. 183-207, figs. 7, *Siced. abs.* p. 207).—These papers cover mainly a description of a new hydrologic soil series and a report of some chemical and physical properties. In I, Loss on ignition, pH, and amphoteric reactions, by Mattson and H. Lönnermark, results are presented, in the form of charts, for 190 samples from a hydrologic series of 15 Podzol profiles, giving loss on ignition, pH, and amphoteric reactions. In II, The loss on ignition and the reaction of the Annerstad series, by H. Lönnermark, L. Wiklander, and S. Mattson, Annerstad soil, a new hydrologic soil series, located near the south end of Lake Bolmen in the province of Småland in southern Sweden, is described in detail.

Chemical and physical properties of soils and of their colloids developed from granitic materials in the Mojave Desert, I. C. BROWN and M. DROSDOFF. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 5, pp. 335-352).—Of the six Mojave Desert profiles studied, three were residual soils derived from granite, the others from alluvial fan material. Well-developed clay pan horizons were found in five of these soils, none in the remaining one. All were found near Mojave, Calif., at from 2,700 to 3,000 ft., and have developed under about 5 in. annual rainfall and at an annual mean temperature of about 65° F. The observed chemical alteration of clay pan soils was greater than the moisture supplied by the rainfall of the desert is expected to produce. Neither the chemical nor the mineralogical composition of the colloids appeared to be influenced by the formation of a clay pan in these desert soils. The colloids were found saturated with bases, chiefly calcium and magnesium. Of the total iron, 25 percent was present as free iron oxide. X-ray data indicated that about 75 percent of the colloids consists of a mixed-layer mineral of hydrous mica and montmorillonite similar to the coarse weathered mica in the soil. About 25 percent was kaolinite (halloysite).

Soils of Michigan, C. E. MILLAR. (Coop. U. S. D. A.). (*Michigan Sta. Cir.* 176 (1940), pp. 20, figs. 9).—Michigan soils are considered from the standpoint of formation, soil-forming processes, productivity, and recommended management practices. On a state-wide productivity basis, Michigan contains from 9 to 10 million acres of land classed as excellent to good soils well suited for farming; and 10 to 11 million acres of good to fair soils which are mainly suited for farming with occasional areas which require special farming methods or should be retired from agricultural use under present conditions; 7 million acres of fair to poor soil, part of which should be retired from agricultural use due to stoniness, poor drainage, unfavorable topography, or droughtiness; and from 9 to 10 million acres of soil which is submarginal for ordinary crop production. Proper use and maintenance of soils to protect fertility is a national problem.

Survey of the most important tobacco soils of the Union of South Africa, J. L. STEENKAMP (*Union So. Africa Dept. Agr. and Forestry Bul.* 213 (1940), pp. 74).—Tobacco produced in South Africa is used almost entirely for cigarettes, pipes, rolls, or snuff. Water control is one of the factors limiting production. The relation of other soil properties to tobacco production is discussed, and detailed soil descriptions and properties for 10 areas are presented. Recommendations for the growing of tobacco on the various areas are also given.

Toxicity of sodium chlorate in three Yakima Valley soils, W. A. HARVEY. (Wash. State Col.). (*Northwest Sci.*, 14 (1940), No. 4, p. 91).—Sodium chlorate effectiveness in laboratory trials as a weed killer was found to be related to soil fertility, more of the chemical being required to kill weeds on fertile soils. Applications of sodium chlorate on soils with a high alkali content may cause them to become tough, to tend to cake when drying out, and to become difficult to cultivate.

Microbial activities in soil.—VI, Microbial numbers and nature of organic matter in various genetic soil types, S. C. VANDECAVEYE and H. KATZNELSON. (Wash. Expt. Sta.). (*Soil Sci.*, 50 (1940), No. 4, pp. 295–311, figs. 3).—This sixth paper of this series (E. S. R., 80, p. 305) reports analyses of soil samples from different horizons of 15 profiles representing a number of different genetic soil types, and gives a general description of the place of origin of each of the soils studied. The samples were placed in gallon glazed pots with moisture adjusted to the normal field-moisture percentage. The pots were covered loosely and incubated at 28° C. Soil-moisture content within narrow limits was maintained by additions of water throughout the experiment. The numbers of bacteria, actinomycetes, fungi, aerobic cellulose-decomposing bacteria, and *Aerobacter* were determined at 4-week intervals. Analyses for ammonia and nitrate nitrogen were made at the beginning and end of the experiment.

Different soil properties were found to have a marked effect on the kind and number of organisms present. Certain genetic soil types supported 19 times as many bacteria, 200 times as many fungi, and 800 times as many actinomycetes as certain other types. The numbers of aerobic cellulose-decomposing bacteria were small in all soils, and only 4 soils contained active *Aerobacter*. No significant relationship was found between the total content of humified organic matter in the soils and their microbial numbers.

The relation of algae to the nitrogen economy of the soil, J. L. STOKES (*Chron. Bot.*, 6 (1941), No. 9, pp. 202–203).—A brief review, including the author's work.

The influence of two *Juniperus* species on soil reaction, S. H. SPURR (*Soil Sci.*, 50 (1940), No. 4, pp. 289–294 figs., 2).—The influence of vegetation on soil reaction was studied in the vicinity of New Haven, Conn., during the fall and winter of 1939–40. Red cedar (*J. virginiana*) and ground juniper (*J. com-*

munis) growing on old field soils were compared in a series of random samples in previously laid-out blocks, and both were found to alter the pH of the soil in which they were grown. *J. virginiana* raises the pH of the upper part of the mineral soil and lowers it at a depth of 6 in., while *J. communis* lowers the pH at both depths. The addition of litter is a very important factor influencing the pH of the upper part of mineral soils. Withdrawal of soluble substances by the roots appears to be equal at a 6-in. depth.

Rate of penetration of lime in soils under permanent grass, T. C. LONG-NECKER and H. B. SPRAGUE. (N. J. Expt. Stas.). (*Soil Sci.*, 50 (1940), No. 4, pp. 277-288, figs. 2).—Samples of 12 soil types common to New Jersey were taken to a depth of 4 in., transported to experimental areas 10 ft. square, and planted to Kentucky bluegrass and red fescue. From 1929 forward, each plat received two applications yearly of 8-6-4 fertilizer, each at the rate of 10 lb. per 1,000 sq. ft. In May 1935 half of each plat was treated with hydrated lime at the rate of 1 ton per acre. In November 1938 an application of finely ground limestone, at the rate of 1 ton per acre, was made to a portion of each plat. One-fourth of each plat received no lime. Soil samples were taken at various months during 1935, 1936, 1937, and 1939 from the various areas. pH and available calcium were determined from different depths under the various soil types. Soil moisture determinations were used as an index of permeability.

The moisture content of the upper 4 in. was greatly increased as a result of liming, and the vigor and density of sod were also improved. The pH rose sharply in the upper inch of all soil types by the end of 6 mo., but substantial changes at 2-, 3-, and 4-in. depths did not occur until after 30 mo. had elapsed. The second lime application, made 42 mo. after the first, produced a sharp increase in pH of the 2-, 3-, and 4-in. layer, within a 12-mo. period.

One ton of finely ground limestone, applied in November 1938, had produced as great an effect on the pH below the upper inch, by the end of 12 mo., as 1 ton of hydrated lime applied in May 1935 after an 18-mo. period. The hydrated lime became caked and dissolved more slowly than the limestone, which remained in a finely divided condition irrespective of moisture conditions. Changes in available calcium varied with the soil type.

Commercial fertilizers, 1940, E. R. TOBEY (*Maine Sta. Off. Insp.* 177 (1940), pp. 51-98).—Reports of the analyses of 408 samples of fertilizers collected and submitted during the year 1940 are reported, according to the requirements of the Maine fertilizer law (E. S. R., 82, p. 452).

Inspection of commercial fertilizers, P. H. SMITH and J. W. KUZMESKI (*Massachusetts Sta. Control Ser. Bul.* 105 (1940), pp. 49).—Detailed analyses and statistical data pertaining to the work of the Massachusetts Fertilizer Control Service for the season of 1940 (E. S. R., 83, p. 168).

Inspection of agricultural lime products, P. H. SMITH and J. W. KUZMESKI (*Massachusetts Sta. Control Ser. Bul.* 106 (1940), pp. 11).—Analyses (E. S. R., 83, p. 168) of hydrated lime, pulverized and ground limestone, and gypsum or land plaster, are reported for the 1940 inspection.

AGRICULTURAL BOTANY

New pronouncing dictionary of plant names, E. R. ROBINSON (*Chicago: Florists' Pub. Co.*, [1939], pp. 64).—This dictionary of plant names and botanical terms, with brief definitions, is intended as a handy reference booklet on pronunciation and spelling.

Georgia medicinal and poisonous plants, R. S. JUSTICE (*Ga. Univ. Bul.*, 39 (1939), No. 8, pp. 27-32, fig. 1).—This includes annotated lists of commercially

important drug and poisonous plants of Georgia, a medicinal plant map, and notes on collecting, markets, and culture.

The flora of Roaring Plains, West Virginia, E. L. CORE (*W. Va. Univ. Bul.*, 40. ser., No. 5-1 (1939), pp. 33-35).

Legumes of the Brazilian Amazon, A. DUCKE (*As Leguminosas da Amazônia Brasileira*. Rio de Janeiro: Min. Agr., Serv. Florestal, 1939, pp. 171, [pls. 5]).—A manual with keys and index to common and scientific names.

A key to the common Leguminosae of the Hawaiian Islands, based upon characters of fruit and leaf, F. E. EGLER (*Syracuse, N. Y.: N. Y. State Col. Forestry*, 1940, pp. [2]+17+12).

Studies in the Patellariaceae, E. T. BUTLER (*Mycologia*, 32 (1940), No. 6, pp. 791-823, figs. 10).—A monographic study of this ascomycete family of the Pezizales, with keys and 50 references.

The genus *Armillaria* in western Washington, H. H. HORSION (*Mycologia*, 32 (1940), No. 6, pp. 776-790, figs. 3).—A monographic study of this fungus genus from the area noted, including a key to the 15 species found and 29 references.

The carbohydrate requirements of *Diplodia macrospora*, A. S. MARGOLIX. (*W. Va. Expt. Sta.*). (*W. Va. Univ. Bul.*, 41. ser., No. 4-II (1940), pp. 56-59).—This study indicated that *D. macrospora* grows equally well on dextrose, sucrose, and maltose if supplied with the necessary auxithal-biotin or a biotinlike substance. If this auxithal is not present, practically no growth occurs on any of these sugars. The excellent growth on brown sugar is believed due to auxithal as an impurity.

Movement of organic solutes in the sausage tree, *Kigelia africana*, H. F. CLEMENTS. (*Hawaii Expt. Sta.*). (*Plant Physiol.*, 15 (1940), No. 4, pp. 689-700, fig. 1).—The growth of fruits of *K. africana* was followed from pollination to maturity to determine the required rate of sugar movement into them. An unsuccessful attempt was made to explain this movement on the assumption of the mass flow hypothesis, and the reasons for its inadequacy are given. The observed movement into the fruit was so great that it seemed necessary to describe it as a function of the living protoplasm of the sieve tubes, which through their respiratory activity performed work in this movement.

Some effects of stannous sulphate and stannic chloride on several herbaceous plants, B. B. COHEN (*Plant Physiol.*, 15 (1940), No. 4, pp. 755-760, figs. 3).—"A method for the detection of bivalent tin in plant tissues has been devised. In the sunflower, 0.01 and 0.05 p. p. m. of tin as tin chloride stimulates root growth. Concentrations of tin, either as chloride or sulfate, in concentrations of 5 or more p. p. m. have toxic effects upon corn, pea, and sunflower."

Investigations on the influence of the electrolyte content of the soil water on the transpiration rate in grapevines [trans. title], L. WIENKE (*Planta, Arch. Wiss. Bot.*, 31 (1940), No. 1, pp. 22-31, figs. 13).—In potted vines of different grape varieties the transpiration rate was measured daily at 1½-hr. intervals and curves were drawn, the rate being determined by the Huber technic. These curves exhibited characteristic fluctuations, with maxima at the time of strongest sunlight. When these vines were treated to 0.5 percent solutions of KCl or potassium phthalate or to 0.025 percent solutions of boric acid or ZnSO₄, a strong increase in the transpiration rate followed. The form of the curves remained the same, only their values becoming higher.

A simple method of diagnosing plant deficiencies, G. M. SHEAR. (*Va. Expt. Sta.*). (*Va. Acad. Sci. Proc.*, 1940, p. 213).—Note.

The regulation of plant growth, F. W. WENT (In *Science in Progress*, edited by G. A. BATTSELL. New Haven: Yale Univ. Press; London: Oxford Univ. Press, 1940, [vol. 2], pp. 33-54, figs. 3).—In this review of recent develop-

ments in the field of growth hormones (growth substances) in plants, the author has aimed "to present a synthetic picture of a plant in its growth and development as far as our present knowledge allows."

Experimental studies of the relation between vitamin requirements and loss of the synthesizing capacity in some mixotrophic algae [trans. title], K. ONDRATSCHEK (*Arch. Mikrobiol.*, 11 (1940), No. 3, pp. 228-238).

Effects of environmental factors on oxidizing enzymes of rose mallow seeds, K. STALEY (*Plant Physiol.*, 15 (1940), No. 4, pp. 625-644, figs. 8).—In the earliest germination stages of these seeds the catalase activity was depressed, but soon increased rapidly as germination progressed. The oxidase showed some fluctuation at first, then increased according to the germination rate. At 8° C. germination and catalase and oxidase activity were slowed up, but 20°-27° favored both germination and enzyme activity. Above 40° germination was inhibited, and correspondingly the enzymes decreased very rapidly. Excess or adequate supplies of O₂ favored germination and also an increase in enzyme activity. With limited or inadequate O₂ there was a tendency toward retardation of both germination and enzyme activity. There is thus a close relationship between the environmental factors and oxidizing enzyme activity in rose mallow seeds.

The growth rate of some fungi in the presence of cocarboxylase, and the moieties of thiamin, V. G. LILLY and L. H. LEONIAN. (W. Va. Expt. Sta.). (*W. Va. Univ. Bul.*, 41. ser., No. 4-II (1940), pp. 44-49).—Of the four heterotrophic fungi tested (*Rhizopus suinus*, *Mucor ramannianus*, *Pythiomyces gonapodioides*, and *Phycomyces blaksleeanus*) cocarboxylase, a pyrophosphoric ester of thiamin, induced slower initial growth than thiamin in three species and greater in one. With three of them autolysis occurred later in the presence of cocarboxylase than in that of thiamin. This was true whether the cocarboxylase induced a more or less rapid initial growth rate than thiamin. Under the test conditions, thiamin produced only an initial depression in the growth rate of *R. suinus*.

Biotin as a growth stimulant for the root nodule bacteria, P. M. WEST and P. W. WILSON. (Univ. Wis.). (*Enzymologia*, 8 (1940), No. 2-3, pp. 152-162, figs. 7; *Fr. abs.*, p. 161).—The nature of the heat-stable factor which markedly accelerates the growth of *Rhizobium trifolii* was studied with the following results: "The active substance is not replaceable by crystalline thiamin, cocarboxylase, riboflavin, nicotinic acid and amide, adenine, cozymase, vitamin B₆, β -alanine, uracil, inositol, ascorbic acid, ergosterol, β -idole-3-acetic acid, 18 amino acids, or concentrates of 'sporogenes vitamin' or pantothenic acid. Treatment of yeast extract by hydrolysis with acid or alkali, oxidation, adsorption, or extraction with various solvents affected its power to stimulate either *R. trifolii* or *Saccharomyces cerevisiae* to the same extent, indicating that the two organisms may have a factor in common. Concentrates of biotin, prepared by the procedure of Kögl and Tönnis,¹ are highly stimulative to the growth of *R. trifolii*. At each step in the fractionation of egg yolk, the increase in purification of the heat-stable *Rhizobium* factor and biotin was found to be nearly identical. No qualitative differences could be found between the physiological effects of 'coenzyme R' preparations and biotin concentrates on either yeast or Rhizobia. Both active fractions stimulated yeast growth only in the presence of pantothenic acid or β -alanine; either promoted growth of Rhizobia without any supplement, although their effects were enhanced by the addition of the other factors. The presence of biotin in coenzyme R preparations was demonstrated, using *Nematospora gossypii* as a test organism. The amount of biotin found accounted for the quantitative

¹ Hoppe-Seyler's Ztschr. Physiol. Chem., 242 (1936), No. 1-2, pp. 43-73, figs. 3.

differences in activity between coenzyme R and biotin concentrate for *Rhizobia* and yeast."

Further studies on the action of aneurin and biotin on the growth of mycorrhiza [trans. title], E. MELIN and B. NYMAN (*Arch. Mikrobiol.*, 11 (1940), No. 3, pp. 318-328, figs. 3).—In this and the previous investigation,² aneurin (vitamin B₁) exerted a strong stimulating action on various mycorrhizal fungi, whereas biotin stimulated some but not all species tested. In addition, two species of *Boletus* and *Cenococcum grandiforme* were apparently able to synthesize aneurin. It is considered of great interest that the mycorrhizas of trees are not physiologically equivalent with regard to their growth substance requirements.

Effects of thiamin, its components, and heteroauxin on the growth of three parasites of wheat [trans. title], G. DÉFAGO (*Phytopathol. Ztschr.*, 13 (1940), No. 3, pp. 293-315, figs. 5).—The fungi concerned were those causing bunt (*Tilletia tritici*), foot rot (*Cercospora herpotrichoides*), and take-all (*Ophiobolus herpotrichus*).

Influence of auxins on reproduction of *Lemna major*, N. A. CLARK and E. E. FRAHM (Iowa State Col.). (*Plant Physiol.*, 15 (1940), No. 4, pp. 735-741, fig. 1).—Indole-3-acetic, phenylacetic, and phenylpropionic acids in various concentrations were tested on *L. major* grown in inorganic solutions under controlled light and temperature and free from micro-organisms. Added to the media twice weekly, the auxins failed to increase the reproduction markedly at 0.01 mg. per liter or lower, and higher concentrations were more or less toxic, 10 mg. per liter or slightly above killing the plants. Intermittent applications produced increased reproduction, the last two acids proving more effective than the first. Following subjection to the influence of the auxins, the plants returned to the normal reproduction rate when placed in standard inorganic medium.

Some root-forming substances, in relation to one another, to plant metabolism, and to growth, M. A. H. TINCKER (*Ann. Appl. Biol.*, 27 (1940), No. 2, pp. 184-195, fig. 1).—"Tested on cuttings, indolylacetic acid and indolylbutyric acid are active growth substances. Several derivatives of tyrosine and histidine proved inactive, and from phenylalanine substances like phenylacetic and β -phenylpropionic acids possess low activity. Tetrahydronaphthylideneacetic acid, m. p. 92° C., is highly active, its isomeride less so. By dehydration of tetralolacetic acid a useful active mixture is obtained. 2-Phenanthryl and 3-phenanthrylacetic acid proved inactive, as did also cyclopentylideneacetic and fluorenylideneacetic. Growth substances when applied to seeds by soaking caused the resulting seedlings to be no heavier than those untreated. When applied to annuals at a wide range of concentration these substances produced no stimulus but only toxic effects at higher concentrations. Applied to bulbs the growth substances checked stem elongation. In unusual circumstances the growth substances may cause accelerated development of roots from bulbs. The relationship between certain amino acids and some active growth substances is briefly discussed. Cell division is a prominent feature of the response shown by cuttings.

The presence of an inhibitor in plant extracts and its relation to the growth substance content and output in plants and plant parts [trans. title], H. LINSE (*Planta, Arch. Wiss. Bot.*, 31 (1940), No. 1, pp. 32-59, figs. 18).

A study of the pigments produced in darkness by certain green algae, J. MYERS (Univ. Minn.). (*Plant Physiol.*, 15 (1940), No. 4, pp. 575-588, figs. 5).—The pigments produced by *Protococcus* sp. and *Chlorella vulgaris* in darkness were studied with a photoelectric spectrophotometer and compared with those produced in the light, by a method not previously used in pigment work. No significant qualitative differences were found. For the *C. vulgaris* strain

² Bot. Notiser, 1939, No. 1, pp. 241-245.

used. the pigments produced in darkness were adequate for photosynthesis. From a comparison of the results obtained with data in the literature, it is suggested that there is a dissimilarity between the induction in O_2 evolution and the induction in CO_2 uptake.

Respiration of cereal grains and flaxseed, C. H. BAILEY. (Univ. Minn.). (*Plant Physiol.*, 15 (1940), No. 2, pp. 257-274, figs. 5).—Curves showing the relationship between moisture content and respiratory rate in stored cereals are expressed by an exponential formula approaching a linear form when the logarithm of the respiratory rate is recorded against the arithmetical progression of moisture content. Formulas are given. Wheat, rice, and barley behaved much alike in these particulars. Oats displayed less respiratory acceleration per unit increase in moisture than did rice, barley, and wheat, whereas rye deviated still more in this respect. No significant correlation between market grade of barley and oats and their respiratory rates at unit moisture levels appeared in these studies. Shriveled or small barley kernels gave a higher respiratory level than plump or large kernels, a situation previously noted for wheat. At all moisture levels tried, flaxseed respired much more vigorously than cereals. The difference may result from the fact that the actual moisture content of the hydrophylic substances in flaxseed may be substantially higher than suggested by the percentage of moisture in the entire seed. Relative capacitance of cereal grains may be more highly correlated with respiratory rate than any other single chemical or physical determination hitherto used as a basis of prediction.

An estimation of the volume of water made available by root extension, P. J. KRAMER and T. S. COILE (*Plant Physiol.*, 15 (1940), No. 4, pp. 743-747).—Using the data of Dittmer (*E. S. R.*, 78, p. 869), the volume of water made available daily by root growth was calculated for winter rye. It was assumed that the roots contacted all soil particles in a cylinder 2 mm. in diameter and that 3.1 miles of roots were added daily. This amount of root extension would make available about 1.6 l. of water daily in a sandy loam at field capacity and about 2.9 l. in a heavy clay soil. It is apparent that at least under some conditions root extension might supply all the water required by a plant.

Studies on the protoplasmic nature of stimulation and anesthesia, II, H. T. NORTHEX. (Univ. Wyo.). (*Plant Physiol.*, 15 (1940), No. 4, pp. 645-660, figs. 5).—In a recent paper² the author discussed the protoplasmic nature of stimulation and anesthesia. Since then the effects of other stimulating agents on protoplasm in cells of *Spirogyra* have been studied, and the data here presented are believed to demonstrate that electricity, disease, CO_2 , cold, and mechanical impacts cause a decrease in the structural viscosity of protoplasm.

Atypical growth, abnormal mitosis, and polyploidy induced by ethylmercury-chloride, D. KOSTOFF (*Phytopathol. Ztschr.*, 13 (1940), No. 1, pp. 91-96, figs. 2).—The experimental plants used were *Secale cereale* and *Triticum* spp.

Colchicine polyploidy and technique, H. DERMEN. (U. S. D. A.). (*Bot. Rev.*, 6 (1940), No. 11, pp. 599-635).—A comprehensive review (87 references) covering the history of the subject, comparative cytological effects of temperature and of colchicine, reactions of animal and of plant cells to colchicine, technic of application, detection and determination of polyploidy, and the nature of some of the changes following induced polyploidy.

Use of photomicrography in mycological research, T. BENEDEK (*Chron. Bot.*, 6 (1941), No. 9, pp. 201-202, fig. 1).

Recent advances in microtechnique.—II, The paraffin method in plant cytology, P. MAHESHWARI (*Cytologia*, 10 (1939), No. 1-2, pp. 257-281).—This

² *Cytologia*, 10 (1939), No. 1-2. pp. 105-112.

contribution to the series (E. S. R., 77, p. 596) contains over three pages of literature references.

Cytophysiologic studies of the petiolar nectaries of the leaf of *Ricinus communis* [trans. title], A. GONÇALVES DA CUNHA (*Bol. Soc. Broteriana*, 2. ser., 13 (1938-39), pp. 1-28, pls. 2).

The growth and anatomical structure of the carrot (*Daucus carota*) as affected by boron deficiency, K. WABINGTON (*Ann. Appl. Biol.*, 27 (1940), No. 2, pp. 176-183, pls. 2, figs. 7).—Carrots grown in nutrient solution minus B were unable to complete normal development and exhibited both external and internal deficiency systems, which are described in detail. Recovery of both shoot and root took place when B was added, even after prolonged growth in its absence. When the culture solutions were renewed regularly, 1 part boric acid in 2,000,000 proved sufficient to maintain healthy growth.

Observations on the microflora of ageing cigarette leaf tobacco, W. E. GRUNDY and J. J. REM. (Pa. State Col.). (*Jour. Bact.*, 40 (1940), No. 3, p. 462).—An abstract.

The utilization of hydrocarbons by bacteria, R. J. STRAWINSKI and R. W. STONE. (Pa. State Col.). (*Jour. Bact.*, 40 (1940), No. 3, p. 461).—An abstract.

Coliform bacteria and streptococci in swimming pool water, R. L. FRANCE and J. E. FULLER. (Mass. Expt. Sta.). (*Amer. Jour. Pub. Health*, 30 (1940), No. 9, pp. 1059-1062).—Comparing the streptococcus and coliform tests in a college swimming pool, it was the exception rather than the rule to find coliform bacteria, whereas streptococci were always present when bathers were in the pool. These streptococci proved resistant to chlorine. It is believed that these organisms come from the mouths of the bathers, though it is possible that they may come from both the oral cavity and the body surface.

GENETICS

Nucleoli and sat-chromosomes, F. RESENDE (*Bol. Soc. Broteriana*, 2. ser., 13 (1938-39), pp. 391-424, figs. 5).—This address considers the behavior of nucleoli during mitosis in the higher plants, relations between the satellited chromosomes and the nucleoli in the higher plants, satellited and nonsatellited constrictions, nuclear asymmetry, satellites and the systematics of higher plants, the value of nucleoli in exhaustive studies of the set of chromosomes, nucleoli in lower plants, and the satellited chromosomes and nucleoli in animals. There are about two and a half pages of references.

Hybrid vigor and its utilization in sweet corn breeding, W. R. SINGLETON. (Conn. [New Haven] Expt. Sta.). (*Amer. Nat.*, 75 (1941), No. 756, pp. 48-60).—In this review of the research underlying the utilization of hybrid vigor in plant breeding, particularly that of corn, the author points out that the utilization of hybrid vigor in corn improvement has far exceeded the knowledge of the phenomenon itself. At present the only way to determine the merit of an inbred line is to test it by crossing, although such analysis is now made at a much earlier generation than formerly. Since there is small positive correlation between good growth in inbreds and hybrids, the author suggests that the genes responsible for hybrid vigor must be different from the normal growth-promoting genes. Possibly the genes responsible for heterosis act more in the nature of complementary factors similar to the color genes A, C, and R that give a colored aleurone when all are present and a colorless aleurone when any one is lacking.

Chromosome number and behaviour in a plant breeder's sample of pentaploid wheat hybrid derivatives, R. M. LOVE (*Canad. Jour. Res.*, 18 (1940), No. 9, Sect. C, pp. 415-434, pl. 1).—Meiosis was studied in Marquis, Marquillo, Hope, and R. L. 729, all *Triticum vulgare*, in Jumillo durum, and in 336 rust-

resistant selections from their pentaploid hybrids. In the F_1 to F_7 material in 50 lines subjected to rigorous selection, plants were found with 28, 38, 39, 40, 41, 42, and 43 chromosomes, while less than 42 percent of the plants had 42 chromosomes—the vulgare number. Half of the plants were heterozygous for arrangement of one or more chromosome segments. Chromosome aberrations detected were, in order of frequency, inversions, translocations, deficiencies, and duplications. All types of aberration were transmitted from F_7 to F_1 in some cases. Incidence of natural crossing in the aberrant plants was much higher than in normal wheats. One suggestion is that plant breeders use as parents only those plants known to be stable cytologically.

Genetic relations of sparse lint, naked seeds, and some other characters in upland cotton, J. O. WARE (*Arkansas Sta. Bul. 406 (1941), pp. 32, fig. 1*).—Selfed lines from upland (*Gossypium hirsutum*) cotton varieties were involved in the study of lint level with respect to seed cover in the crosses No Lint \times Sproull and No Lint \times Hastings Upright, and in the study of seed cover and leaf shape (also including lint level) in No Lint \times Okra Leaf. No Lint was characterized by sparse lint, naked seeds, and normal shaped leaves; Sproull and Hastings Upright by abundant lint, covered seeds, and also normal shaped leaves; and Okra Leaf by abundant lint, covered seeds, and okra-like leaves. One progeny generation from each parental plant was grown for comparison with their respective hybrid generations carried through F_1 and F_2 . F_1 progenies from backcrosses to both parents were also grown.

Seeds in the F_1 were free of fuzz but had abundant lint which was at a level somewhat lower than in the high-lint parents. In the normal and okra leaf crosses, the F_1 had leaves of an intergrade shape. In the F_2 the seed cover segregated according to the 1:2:1 ratio into fuzzy, intermediate or naked-adherent, and naked classes. In the naked-adherent class the seed coat condition was free of fuzz but with scattered broken-off lint base segments which caused the seeds to have a certain downy-like appearance. When the F_1 was backcrossed to the fuzzy seeded parent, the progenies segregated into fuzzy and naked-adherent classes, while with the backcross to the naked seeded parent segregation was into naked-adherent and naked classes. The backcross ratio was 1:1. In the F_2 , as well as in backcross progenies, fuzzy classes had lint at the normal level and resembled production in the original fuzzy seeded parents. The naked-adherent classes in these groups had abundant lint but at a definitely lower level than in the fuzzy class. In all naked classes the lint was as sparse as in the naked seeded parents but at a level somewhat higher than in these parents.

Leaf shape segregated in the same manner as seed cover in F_2 and backcrosses from the No Lint \times Okra Leaf, i. e., into nine classes according to the 1:2:1:2:4:2:1:2:1 ratio in F_2 and into four classes in backcross progenies, indicating that leaf shape is independent of seed cover as well as of lint level. Seed cover and high lint appeared to be controlled by the same gene or by two very closely linked genes. One or more minor modifying factors appeared to affect lint development without altering the fuzz covering to any extent. Inheritance of seed index evidently was more complex than that of seed cover, lint level, or leaf shape. The seed indexes in the F_1 leveled out practically among the seed cover classes, whether or not the parental contrast was large or small. The fuzzy class usually was the heavier, but possibly no more than was represented by the extra weight of attached fuzz. In the progeny from the backcross on Sproull, which had much heavier seed, the fuzzy class of the progeny approached the original parent in seed index. The naked-adherent class was also higher than in other combinations.

Chromosomal deficiencies in *Datura stramonium* induced by colchicine treatment. A. D. REBNER, A. G. AVERY, and A. F. BLAKESLEE (*Amer. Jour. Bot.*, 27 (1940), No. 8, pp. 676-683, figs. 3).—Among 2,000 *D. stramonium* plants from colchicine-treated seed, 88 exhibited deficiencies. In them a total of 173 chromosomes had been lost. There were 7 diploid ($2n-1$) deficiencies, this frequency being about 70 times the rate for untreated plants. Among the 81 plants with tetraploid deficiencies, the chromosome count ranged from 42 to 47 ($n=12$). The 46 and less than 46 chromosome plants exhibited 2 types of deficiency, viz, loss of 1 chromosome of a kind and loss of 2 of a kind. The largest chromosome was missing more often than any other. No deficient plants were found among the offspring of selfed $2n$ deficiencies. Presumably $n-1$ microspores and megaspores are unable to produce viable gametophytes. Fewer viable seeds were obtained by selfing $4n$ deficiencies lacking 2 chromosomes of the same kind. Apparently $2n-1$ microspores usually do not produce viable male gametophytes. Both diploid and tetraploid types with extra chromosomes were also found among plants grown from treated seeds, the rate being about 3 times the normal rate at which $2n+1$ plants are produced by $2n$ parents. It is suggested that chromosome losses result from lagging and nondisjunction during mitosis. These losses may or may not be associated with doubling of the total number. Acquisition of extra chromosomes could result from nondisjunction.

[Experiments in animal genetics and physiology of reproduction by the Bureau of Animal Industry]. (Partly coop. Mont., Mo., Idaho, W. Va., Fla., and S. Dak. Expt. Stas. et al.). (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.*, 1940, pp. 10, 11, 12, 18-20, 26-29, 30-31, 31-34, 37-38, 39-41).—There are included progress reports on the following investigations: Artificial insemination and semen storage for cattle, inheritance of intelligence and temperament in dogs, reproductive cycle in fur-bearing animals, synthesis of compounds related to sex hormones, breeding and crossing beef and dual-purpose cattle and record-of-performance study, crossing sheep and goat breeds for fleece and meat production, crossing and selecting swine, artificial insemination of horses, development of a small-type white turkey, blood spots in eggs, relation of railroad shipment to viability of chickens, and status of the national poultry improvement plan.

[Investigations in animal genetics and physiology of reproduction by the Cornell Station] (*[New York] Cornell Sta. Rpt.* 1940, pp. 103-104, 105-106, 165-169).—Reports are given of progress on studies by S. A. Asdell, S. E. Smith, F. I. Elliott, M. G. Fincher, G. W. Salisbury, E. L. Willett, E. S. Harrison, E. S. Savage, J. P. Willman, I. C. Gunsalus, F. B. Hutt, J. H. Bruckner, R. K. Cole, G. O. Hall, A. L. Romanoff, and W. F. Lamoreux in the following subjects: Failure of gonadotropic hormones to increase fertility of sterile cows; reaction of vaginal mucus of sterile and normal cows; technic of artificial insemination and measuring quality of semen; genetic resistance to mortality and poultry diseases—fowl cholera and neoplasms; variation of eggshell color between white- and brown-egg breeds; location of genes in six chromosomes in fowls; early detection of infertile eggs; genetics of the pheasant; strains of poultry differing in egg production and relation of ♂ and ♀ hormones to reproduction in the fowl; and infertility in the fowl.

[Investigations in animal genetics by the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt.* 1939-40, pp. 61-62, 63-65, 143-144, 144-146, 156, figs. 2).—Brief results are presented on the following projects, carried on by H. M. Briggs, R. G. Jaap, and T. T. Milby: Twinning in a strain of Hampshire sheep increased by selection, dam-daughter comparisons which indicate the inheritance of wool production, desirable types of Duroc-Jersey sows, differences in individuals as regards feed utilization, swine records indicate difficulties of making selections,

selection from small litter may prove misleading. measurement tables give guide for use in selecting breeders among poultry, heritable differences in body conformation of poultry, value of cross-bred poultry for meat production, inheritance of baldness in chicks, and breeder selection program improves hatchability of turkey eggs.

[Studies in animal breeding by the West Virginia Station]. (Partly coop. U. S. D. A.). (*West Virginia Sta. Bul.* 298 (1940), pp. 18-19, 22-23).—The results of projects carried on by C. V. Wilson, D. A. Spencer, E. T. Wightman, E. N. Moore, T. B. Clark, and E. A. Livesay included the following: Backcrossing Corriedale and Hampshire ewes with Corriedale rams for wool and mutton, selecting White Leghorn breeders for long life in progeny, and cross-breeding turkeys for better market quality.

[Papers on sex control presented at the American Society of Animal Production symposium, November 30, 1940] (*Jour. Hered.*, 31 (1940), No. 12, pp. 498-505, fig. 1).—Three papers on sex control by methods recommended by Warren (E. S. R., 83, p. 615) were presented, as follows:

The effect of lactic acid and sodium bicarbonate on the sex ratio, E. Roberts (pp. 499, 500) (Univ. Ill.).—In these tests there were produced 32 litters by ♀s douches with 2 percent lactic acid in which the progeny were 111 ♂s and 163 ♀s. Seventy-one litters were produced after douches with 3 percent lactic acid of which the young were 169 ♂s and 304 ♀s. Following douches with 3 and 5 percent sodium bicarbonate the young produced were 154 ♂s and 123 ♀s and 366 ♂s and 177 ♀s, respectively. Considering the litters of the same ♀s treated alternately with both solutions, bicarbonate solution produced an excess of ♂s, and lactic acid an excess of ♀s in the progeny.

A test of sex control by modification of the acid-alkaline balance (preliminary report), L. J. Cole, E. Waletzky, and M. Shackelford (pp. 501, 502) (Univ. Wis.).—Douching the dams of 271 litters of rats for sex control showed deviations of little more than the probable errors from the mean, with the highest percentage of ♂s in the controls. Similar results were obtained from douching rabbits with 2-percent solutions. To test the theory more critically, the pH of rabbit semen was altered by KH_2PO_4 and NaHCO_3 solutions. The semen was then used for artificial insemination. Fertilization with sperm of pH 5.6 to 6.2 produced 29 ♂s and 35 ♀s, and semen with pH 7.0 and 9.2 produced 20 ♂s to 23 ♀s. There were no young resulting from sperm of pH 3.8 to 5.1. Thus the effectiveness of sex control by acid and alkaline douches and by modification of the pH of semen for artificial insemination in rabbits was entirely negative.

An experimental attempt to modify the sex ratio in rats and rabbits, J. H. Quisenberry and S. V. Chandiramani (pp. 503-505) (Tex. A. and M. Col.).—In two strains of rats the young produced by alkali- and acid-douched ♀s did not give support to the methods of controlling sex by douching. However, copulation in rabbits took place immediately after the treatment and gave a sex ratio with sufficient departure from equality to offer promise for further testing, although the numbers were small.

The inheritance of an albumen quality characteristic of chicken eggs, F. W. LORENZ and L. W. TAYLOR. (Calif. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 4, pp. 293-301).—Continuing the studies of the inheritance of high and low firm egg albumen (E. S. R., 72, p. 172), 5 years' data on selection in two litters showed a continuous highly significant difference of 11.37 ± 0.46 percent in firm albumen between the two lines over the entire period, with some increase in this difference in the later years. This was similar to the findings of Knox and Godfrey (E. S. R., 84, p. 314). A variance analysis within and between dams gave further support to the inheritance of the condition by the significance of differences between families. The percentage of firm albumen in eggs pro-

duced by crossbreds was intermediate between the high and low lines, and backcrosses were also intermediate between the parents. However, the percentage of firm albumen resulting from any cross approached the phenotype of the dam's line more closely than that of the sire's line. Forty-five percent of the variance of the albumen thickness of the daughters' egg quality was explained by the quality of the eggs produced by the dams, dams' sisters, and sires' sisters. Multiple-gene inheritance of the character and the substantial importance of the sire seemed indicated.

Some physiological effects in animals of a plant hormone "auxiphyle" from peas, H. C. CAMERON. (W. Va. Expt. Sta.). (W. Va. Univ. Bul., 40. ser., No. 5-1 (1939), p. 50).—A substance isolated from peas and giving a positive chemical test for oestrogenic substances was found to induce oestrus in spayed rats and mice. When injected twice daily for 10 days it caused a decrease of from 25 to 75 percent in the weight of the testes in rats.

The influence of X-rays on pigment production in the bird feather [trans. title], W. GREITE (*Biol. Zentbl.*, 60 (1940), No. 5-6, pp. 258-267, figs. 6).—Treatment of pigeons and Brown Leghorns with X-rays was found, as in the case of studies by DeBoer (*E. S. R.*, 84, p. 462), to cause bleaching of the newly developed feathers, the degree depending upon the strength of the dose administered. Bleaching or speckling effects were apparent in the third feather generation after treatment with 1,250 r. (roentgen rays).

Qualitative changes in the gonadotropic complex of the rat pituitary following removal of the testes, A. A. HELLBAUM and R. O. GREEP (*Amer. Jour. Anat.*, 67 (1940), No. 2, pp. 287-304).—Study was given to the gonadotropic effects of fresh or powdered suspensions of pituitaries of 482 ♂ rats, part of which were castrated at different ages. A total of 334 normal or hypophysectomized immature ♀s served for carrying out the assays. The results showed the pituitaries of normal ♂s to possess relatively little ability to stimulate development of corpora lutea in immature ♀s. The pituitaries of castrated ♂s produced primarily follicle development until from 15 to 20 days after castration, when corpus luteum formation was induced. It is suggested that the luteinizing factor of the pituitary is not released in the absence of the testicular hormone but is stored in the gland. Other studies indicated that in the normal ♂ the testicular secretion continually inhibits the release of the follicle-stimulating hormone. Implanted pituitaries failed to release their stored luteinizing hormone in immature recipients because of the absence of the releasing stimulus. The pituitaries of adult ♂s castrated 20 days to 9 mo. invariably induced corpus luteum formation, but later follicle stimulation only was retained. The luteinizing effect of pituitaries from ♂s castrated at 25 days on normal ♀s was retained about 17 mo. However, in hypophysectomized ♀s this property lasted only 13 mo. Implants of pituitaries from castrated donors stimulated only follicle development, but when the graft was recovered and was readministered as a suspension corpus luteum development was induced. The similarity between the pituitary hormone producing luteinization and interstitial cell stimulation in the ♀ and in the ♂ is suggested.

Masculinization of female rats treated with testosterone propionate, K. E. PASCHKIS, H. SHAY, J. GERSHON-COHEN, and S. S. FELS (*Amer. Jour. Physiol.*, 129 (1940), No. 1, pp. 191-194, figs. 4).—Female rats treated for from 3.5 to 13 mo. of age with total doses of from 45 to 150 mg. of testosterone propionate showed the formation of two masculine features, including the development of scrotal layers containing tubuli and coarse masculine hair.

A technic suppressing development of reproductive function and sensitivity to estrogen in the female rat, J. G. WILSON, W. C. YOUNG, and J. B. HAMILTON (*Yale Jour. Biol. and Med.*, 13 (1940), No. 2, pp. 189-202, pls. 3).—

Female rats subjected to treatment with testosterone propionate during early postnatal development failed to display spontaneous cyclic changes and ovulation. Normal mating behavior and normal growth of uterine tissues did not follow injections of oestradiol benzoate followed by progesterone. A few animals responded when the androgen was prenatally administered or when excessive doses of oestrogen were given.

There were three groups of ♀s employed in the tests. Testosterone was injected daily for 3 days after the sixteenth day of gestation, so that the total amount varied from 1.5 to 6 mg. per animal. The ♀ young received a total of 12 mg. postnatally over a 4-week period. A second group of pregnant ♀s received total doses of from 6 to 50 mg., and the young received no androgen after birth. The third group of young was given from 3 to 36 mg. in graded doses after birth. Administration of 3 mg. or more of androgen during 28 days of postnatal life rendered the ♀ insensitive to injections of oestradiol benzoate followed by progesterone in amounts 10 times greater than that required to produce oestrous response in spayed control animals. Thus, androgens after birth were mainly effective, whereas those prior to birth had little effect.

Site of action of oestrogens, J. M. ROBSON and J. ADLER (*Nature [London]*, 146 (1940), No. 3689, p. 60).—Natural and synthetic oestrogens were shown to induce cornification in the vaginas of mice by local action. They were not dependent on absorption by the circulatory system. The conclusion was derived from study of the effect of small doses of oestradiol, stilboestrol, and oestriol glucuronide injected into a portion of the upper part of the vagina severed from the rest of the organ and implanted in the abdominal wall. Vaginal responses were less in the other portions of the vagina, although both received blood circulation.

The effect of combinations of amniotin and progesterone on the uterine weights of rats and mice, L. J. ZELDIS (*Amer. Jour. Physiol.*, 129 (1940), No. 3, pp. 546-552).—The administration of from 25γ to 800γ of progesterone with 2 International Units of amniotin to mature and immature mice daily for 5 days caused less response in the uterine weight than when amniotin alone was administered. However, with rats there was no such effect of progesterone in preventing uterine growth from amniotin.

Experimental intersexuality: The effects of estrogens on the antenatal sexual development of the rat, R. R. GREENE, M. W. BURRELL, and A. C. IVY (*Amer. Jour. Anat.*, 67 (1940), No. 2, pp. 305-345, pls. 5).—a-Oestradiol, oestradiol dipropionate, or stilboestrol was used in the treatment of 232 pregnant rats for about the last third of the gestation period in studying the effects on the intersexuality of the progeny. The young were carried to term by 118 ♀s. Among the progeny there were 134 ♀s and 116 ♂s, of which 22 ♀s and 11 ♂s were raised to adult age. Enough young and dams were killed at term for dissection purposes. The results showed that young ♂s had external genitalia of the ♀ type, and the primary and secondary sex organs were modified to a greater or lesser extent toward the ♀. Certain minimal doses of oestrogen were necessary for effects on specific organs. The effect on prenatal development in the rat, mouse, and opossum is shown to differ in that any change in the rat which modifies the internal genitalia also produces abnormalities in the external genitalia. However, in the mouse the effect is less likely to show on the external organs. The influence of androgens on rat, mouse, guinea pig, opossum, and freemartin embryos is tabulated.

FIELD CROPS

[Field crops research in the Bureau of Plant Industry]. (Partly coop. State expt. stas. et al.). (*U. S. Dept. Agr., Bur. Plant Indus. Rpt.*, 1940, pp. 3-6, 6-8, 10-11, 13-15, 22, 23-24, 31, 35-36, 37-40).—Accomplishments and im-

portant progress results are reported from breeding work with corn, wheat, oats, barley, rice, grain sorghum, cotton, white clover, soybeans, Napier grass, potatoes, tobacco, sugarcane, and sugar beets; the development of corn hybrids resistant to insects, flax resistant to freezing injury, alfalfa resistant to bacterial wilt, improved soybeans for the South, Southwest, and the North Central States, improved strains of Napier grass for the South, a sugar beet variety for early planting with resistance to diseases, cold-tolerant sugarcane, and tobacco immune to blue mold disease; effects of colchicine treatments on chromosome numbers in wheat and related genera, cotton, and sugar beets, and its utilization in plant breeding; cotton improvement in one-variety communities; expansion of production and use of corn hybrids, improved wheats, and high-quality rice varieties; relation of soil moisture at seeding time to yield of spring wheat; comparison of diversified cropping with winter wheat alone; use of crotalaria for soil improvement in the South; growing annual lespedeza in combination with bluegrass; improvement of buffalo grass seed production; dependence of irrigation agriculture on crop rotation and livestock; reduction of sugar beet losses by rotation and manure; increase of sugar beet yields by nitrogen fertilization; domestic v. foreign potash for potatoes and fertilizer studies on certified seed potatoes; expansion of domestic sugar beet seed industry and its dependence upon superior varieties; use of ground peanut hulls in promoting growth of tobacco seedlings; and the growing of high-nicotine tobacco for insecticidal purposes.

[Crop plant research of the U. S. Department of Agriculture, 1940] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1940, pp. 148, 149, 152*).—Examples of the application of science in crop production, discussed briefly, include the development and widespread use of Thatcher wheat and hybrid corn, domestic sugar beet seed production as an outgrowth of breeding for disease resistance, and the use of soil moisture content as a criterion of potential wheat yields.

[Research with farm crops in New Jersey]. (Partly coop. U. S. D. A.). (*New Jersey Stat. Rpt. 1940, pp. 59, 65-67, 67-71, 72, 73, 96-98, figs. 3*).—Experimentation with field crops (E. S. R., 83, p. 617) reported on briefly comprised breeding studies with corn, barley, oats, alfalfa, and lawnglass; value of colchicine in potato improvement; variety tests with corn (and hybrids), oats, barley, potatoes, soybeans, alfalfa, lespedeza, and red clover strains; variety-date of planting tests with soybeans; planting corn on contours v. up and down slopes; sowing cover crops in standing corn; merits of winter barley as a grain crop; fertilizer tests with potatoes, sweetpotatoes, and alfalfa (with potash); nitrogen needs of Green Mountain potatoes; markets for New Jersey potatoes; place of Korean lespedeza and *Lespedeza sericea* in New Jersey farming; and experiments with fine turf, including the value of Raritan velvet bent for lawn and other turfs, needs of lawns for lime, and merits of chemicals for control of weeds in lawns and similar turf.

[Field crops and plant improvement research in New York. (Partly coop. U. S. D. A. et al.).] ([*New York*] *Cornell Sta. Rpt. 1940, pp. 94, 96, 97, 117, 118, 143, 144, 145, 178, 179, 183-185*).—Progress results are reported from breeding work by H. B. Hartwig, J. K. Wilson, R. Bradfield, D. B. Johnstone-Wallace, R. B. Musgrave, J. A. Bizzell, L. F. Randolph, D. B. Hand, H. H. Love, W. T. Craig, F. P. Bussell, R. G. Wiggans, C. H. Myers, J. R. Livermore, E. V. Hardenburg, O. Smith, E. N. McCubbin, G. E. Davis, P. H. Wessels, and R. H. White-Stevens with corn, wheat, oats, barley, timothy, soybeans, and potatoes; studies on tetraploid corn and of chromosome number and behavior in fertile and sterile lines of tetraploid corn; an investigation of methods for improving the quality and the economy of production of feed crops in the principal soil and climatic regions of New York; the accretion of nitrogen under several crop-

ping systems, including legumes; methods of hay production and preservation; and potato investigations, including fertilizer, rotation, and irrigation experiments, and studies of ecological factors affecting growth, yield, and seed value of potatoes and of the factors affecting chemical composition and culinary quality of tubers.

[Field crops research in Oklahoma, 1938-40]. (Partly coop. U. S. D. A. et al.). (*Oklahoma Sta. Bion. Rpt. 1939-40*, pp. 26-38, 45, 46, 48-51, 102-104, 105-107, 114, figs. 6).—Brief reports are made on field crops work (E. S. R., 81, p. 35) during the above period by F. T. Dines, C. B. Cross, H. F. Murphy, F. A. Fenton, K. S. Chester, J. C. Ireland, H. E. Dunlavy, I. M. Parrott, H. W. Staten, L. L. Ligon, W. B. Gernert, H. J. Harper, E. F. Burk, H. B. Cordner, and F. A. Romshe, including variety tests with cotton, corn and hybrids, wheat, barley, oats, potatoes, alfalfa, and miscellaneous grasses and legumes; breeding work with cotton, wheat, corn, and barley; winter barley as a substitute for corn; seedbed preparation for fall-sown grains; chemical fertilization of the cotton flowers; an increase of cotton bolls set caused by naphthalene acetic acid sprays; cultural (including planting) experiments with barley, corn, oats, and fall potatoes; merits of fertilizer in a rotation of cotton, oats, cowpeas, and darso, and in a rotation of alfalfa 4 yr. and wheat 4 yr.; effects of fertilizers on yield and milling and baking quality of wheat; fertilizer tests with alfalfa and potatoes; response of crops in rotation and in continuous culture to green manure; draft of corn on soil nitrogen and its replacement; pasture fertilization; and effects of weather on chemical composition of grass.

[Agronomic research in South Dakota]. (Partly coop. U. S. D. A.). (*South Dakota Sta. Rpt. 1940*, pp. 6-14, fig. 1).—Continued experimentation by C. S. Franze, E. L. Erickson, S. P. Swenson, and A. N. Hume with field crops (E. S. R., 82, p. 615) for which progress results are reported included breeding work with corn and hybrids, hard red spring and winter wheat, oats, barley, alfalfa, sweetclover, and sorghum for low HCN content; development of a high-protein strain of corn; cultural tests with crested wheatgrass and corn; corn and sorghum in alternate rows; effect of a nurse crop on grass seedlings; variety tests with soybeans, corn, and forage grasses; and control of bindweed with cultural practices and chemicals.

[Field crops research in Texas]. (Partly coop. U. S. D. A. et al.). (*Texas Sta. Rpt. 1939*, pp. 28, 36-37, 62-79, 81-84, 140-143, 147-148, 155-160, 163-166, 167-169, 170, 180-187, 189-197, 200, 203-204, 205-208, 209, 212-214, 221-223, 226-227, 227-230, 230-233, 234-235, 242-243, 257-258, 259-261, 261-262, 267-271, 274, 279).—Agronomic and plant breeding investigations (E. S. R., 82, p. 472) at the station and substations are briefly reported on work by W. H. Friend, J. F. Wood, R. E. Wright, E. B. Reynolds, P. R. Johnson, D. T. Killough, T. R. Richmond, R. E. Harper, J. O. Beasley, R. H. Wyche, H. M. Beachell, H. P. Smith, D. L. Jones, R. H. Stansel, R. A. Hall, P. B. Drukke, V. L. Cory, W. H. Dameron, R. E. Karper, G. S. Fraps, R. L. Hensel, J. H. Jones, G. C. Warner, E. S. McFadden, P. C. Mangelsdorf, H. E. Ren, R. G. Reeves, J. E. Roberts, E. C. Tullis, A. L. Martin, C. E. Minarik, C. H. Rogers, I. M. Atkins, P. A. Young, J. R. Quinby, J. C. Stephens, L. E. Brooks, E. Mortensen, R. E. Dickson, B. G. Langley, and C. E. Fisher. This included varietal tests with cotton, corn (and corn hybrids), wheat, oats, barley, rice, grain sorghum, sorgo, sugarcane for sirup, flax, soybeans, alfalfa, clover, bur-clover, sweetclover, crotalaria, potatoes, sweetpotatoes, castor-beans, sugar beets, and miscellaneous winter and summer legumes and grasses; production tests with fennugreek, perilla, chia, sunn hemp, and pigeonpeas; flax as a new cash crop for south Texas; sugar beet seed production trials; breeding work with cotton, wheat, oats, barley, corn, sweet corn, rice,

flax, grain sorghum, Sudan grass, sorgo, broomcorn, cowpeas, buffalo and Angleton grasses, and peanuts; development of cotton varieties adapted to mechanical harvesting; composition of seed of different cotton varieties; cytogenetics of cotton; inheritance studies with cotton, corn, broomcorn, and different sorghums; studies of the genetic and cytological relationships of corn, *Euchlaena*, and *Trip-sacum*; hybrid vigor in sorghum; cultural (including planting) tests with cotton, corn, wheat, rice, grain sorghum, buffalo grass, flax, soybeans, alfalfa, sweetclover, and sweetpotatoes; a variety-spacing test with corn; size of seed, height of bed, spacing, rooted v. cut slips, cover crop, and harvesting tests with sweetpotatoes; effects of different plant spacings upon cotton yield and fiber length; cotton topping studies; root initiation of cotton plant material by the use of growth-promoting substances; seedbed preparation studies; a study of the influence of awns on wheat yields; comparisons of corn and sorghums and their effects on succeeding small grain crops; double cropping experiments with sorghum to determine the feasibility of growing two crops of grain from early varieties having favorable characteristics of side branching and tillering; forage yields of corn, sunflower, and sorghum varieties; irrigation tests with cotton and grain sorghum, corn, alfalfa, castor beans, sugar beets, and potatoes; rotation and sequence experiments with different field crops; fertilizer tests with crops in rotation, corn, oats, rice, potatoes, sweetpotatoes, grain sorghum, alfalfa, pasture, and cotton; a minor element spray test with potatoes; methods of applying fertilizers, and carriers of nitrogen and phosphorus for rice; tolerance of rice to different soil reactions; polyhalite as a source of potassium for cotton fertilizers; nitrogen and potash carriers for cotton and corn, cotton burs v. manure as cotton fertilizers; hairy vetch and other green manures for cotton and other crops; inoculation studies with soybeans; soil fertility and improvement studies; germination and longevity of seed and control of bitterweed; control of tabosa grass (*Hilaria mutica*) and pasture weeds; production and germination of buffalo grass seed, composition of buffalo grass strains, and establishment of buffalo grass pasture; and other pasture improvement and management investigations concerned with plants and seeds mixtures for different types of pasture, effects of fertilizer treatments on yield and chemical and botanical composition of herbage, introduction of new grasses and legumes and sods for observation, planting tests with Angleton grass, grazing tests with Sudan grass strains and new grasses, comparison of Sudan grass broadcast and in rows with buffalo grass turf on dry land and under irrigation, combination woodland and pasture studies, effects of fertilizers on production of carpet grass pastures and on establishment and survival of clovers on native pasture, and carrying capacity of improved pastures.

[Field crops research in Utah] (*Utah Sta. Bul.* 294 (1940), pp. 9-10, 10, 15, 26-31, 35-39, 40-41, 43-45, 82-85, figs. 12).—Accomplishments and progress results are reported from experimentation (E. S. R., 80, p. 332) at the station and substations for the biennium ended June 30, 1940, and longer periods, including variety tests with spring and winter wheat, corn and hybrids, alfalfa, soybeans, potatoes, sugar beets, and miscellaneous forage grasses; breeding work with wheat, alfalfa, and grasses; experiments with strawberry clover; seeding tests with soybeans for hay; wheat experiments on dry land concerned with varieties, tillage, harvesting and cultural practices, type of plowing, manuring, green manuring, stubble disposal, cropping systems, and effects of these factors on quality and protein content of grain; studies of the mineral content of wheat (E. S. R., 78, p. 189; 83, p. 770) and on the nutritive value of high v. low calcium and phosphorus-carrying wheats; seeding of pasture mixtures in alfalfa stubble and pasture fertilizer tests; tillage, chemicals, and other weed control measures,

especially with whitetop, morning-glory, Canada thistle, and perennial sow-thistle; and range research, dealing with effects of grazing methods on range plants and their root reserves (E. S. R., 53, p. 763), phosphorus content of summer range plants, range revegetation, effect of spring and fall grazing upon forage production and seeding habits of grass, and germination studies on native species.

[Field crops experiments in West Virginia, 1938-40]. (Partly coop U. S. D. A. et al.). (*West Virginia Sta. Bul.* 298 (1940), pp. 4, 8-11, 15-16).—Crop production and related agronomic research (E. S. R., 80, p. 757), done by F. W. Schaller, G. G. Pohlman, T. C. McIlvaine, W. M. Broadfoot, R. O. Weibel, E. J. Wellhausen, J. L. Cartledge, K. C. Westover, and E. P. Brasher at the station and substations during the biennium ended June 30, 1940, included breeding work with barley, corn, and hybrids; variety tests with corn, wheat, oats, barley, and soybeans; planting tests with barley and oats; fertilizer experiments with wheat and potatoes; fertilizer and liming tests with several field crops in rotation; short-fertilized rotations for early-crop potatoes; response of alfalfa to fertilizers and lime, and its phosphorus deficiency on certain soils; responses of corn to sweetclover as a green manure; and relation of soil fertility to botanical composition of pastures.

Hybrid corn in Ohio—historical notes, G. H. STRINGFIELD. (Coop. U. S. D. A.). (*Ohio Sta. Bimo. Bul.* 208 (1941), pp. 3-5).—A brief historical account of the development of hybrid corn in the United States and its extension in Ohio through efforts of the station, extension service, U. S. Department of Agriculture, other agencies, and growers is presented, with comments on the current status of the industry in the State and on the merits of hybrid seed.

Lespedeza culture and utilization, R. McKee (*U. S. Dept. Agr., Farmers' Bul.* 1852 (1940), pp. [3]+14, figs. 4).—Information on varieties of lespedeza and their adaptation, cultural methods, and field practices involved in growing the crop for hay, pasturage, soil conservation, and soil improvement; the place of lespedeza in cropping systems; and other practices supersedes that given in Leaflet 100 (E. S. R., 70, p. 611) and in Farmers' Bulletin 1724 (E. S. R., 71, p. 469).

Experiments with lespedeza, A. L. GRIZZARD and T. B. HUTCHESON (*Virginia Sta. Bul.* 328 (1940), pp. 20, figs. 3).—Experiments, 1932-40, to determine the best dates of seeding, varietal adaptation, lime requirements, and fertilizer needs of lespedeza on several soil types and under different climatic conditions in Virginia are reported. Korean (*Lespedeza stipulacea*) appeared to be adapted to all sections of the State, while common, Tennessee No. 76, and Kobe (all *L. striata*) were not well adapted for elevations above 1,500 ft. Annual lespedezas have done best when seeded from 40 to 60 days before the last average killing frost date of the section, at rates of from 10 to 30 lb. of viable seed per acre broadcast on small grains, pastures, or specially prepared fields, and covered lightly. Yields of all varieties were increased markedly by fertilizers, and all varieties responded favorably to lime yet varied widely in degree of response. Korean showed a decidedly greater response to lime than any variety of *L. striata*. Sericea (*L. sericea*), the perennial, has produced heavy yields of hay on relatively poor and acid soil without lime, and yields could be increased decidedly by fertilizers. Although sericea may be seeded on small grains in late winter or early spring, best results followed the planting of scarified seed on specially prepared soil from March 15 to April 15. Practical information is included on the uses of the crop, harvesting the seed, and control of dodder.

Management of Korean lespedeza, C. A. HELM (*Missouri Sta. Cir.* 210 (1940), pp. 8, figs. 7).—Management practices for Korean lespedeza (E. S. R., 75, p. 42) grown continuously are suggested, with directions for the preparation of the seed-

bed for spring-sown oats or for winter wheat, rye, or barley to be sown on the land after the lespedeza has matured seed.

Oats in Mississippi. R. KUYKENDALL, J. PITNER, J. F. O'KELLY, J. L. ANTHONY, and C. D. HOOVER (*Mississippi Sta. Bul.* 348 (1940), pp. 22, figs. 10).—Variety, seeding, fertilizer, and rotation experiments with oats, made at the station and substations and with farmers in the hill sections of the State and at the Delta Substation, are summarized with measures for control of oat smut and armyworm. The main conclusions from work in the Delta were noted earlier (E. S. R., 82, p. 475). For the hill sections the Rustproof strains, including Terruf, New Nortex, Applier, Ferguson 922, and Hastings appeared most dependable, and the Fulgrains, Victorgrain, and Fulghum were among the best of the earlier oats. Fall-sown oats have outyielded spring oats. An indicated fertilizer practice was application of 100 lb. of sodium nitrate about March 15. Sodium nitrate produced higher yields than ammonium sulfate or cyanamide.

Studies of oats.—II, Portuguese oats of the section *Euavena* Griseb. [trans. title], A. TABORDA DE MORAIS (*Bol. Soc. Broteriana*, 2. ser., 13 (1938-39), pp. 573-709+[1], pls. 20).—This second contribution* presents a monographic systematic study of this group of the genus *Avena*, including a key to the species and subspecies described.

A study of seedlings and varieties of the Irish potato in Cuba. M. A. TAMARGO (*Amer. Potato Jour.*, 17 (1940), No. 12, pp. 323-327).—The performance of a number of American, German, and wild varieties of potatoes and Cuban seedlings is described from tests during 3 yr. at the experiment station at Santiago de las Vegas.

[Proceedings of the eighteenth and nineteenth annual meetings of the American Soybean Association] (*Amer. Soybean Assoc. Proc.*, 18 (1938), pp. [1]+58; 19 (1939), pp. 72, fig. 1).—Technical papers presented at the eighteenth annual meeting held in Wooster and Columbus, Ohio, September 12-14, 1938, included Progress of the U. S. Regional Soybean Industrial Products Laboratory, by R. T. Milner (pp. 3-5), and Edible Varieties of Soybeans, by W. J. Moore (pp. 30-33) (both U. S. D. A.); Soybeans and Soybean Products as Feed for Dairy Cattle, by C. F. Monroe (pp. 9-16) (43 refs.), Soybean Oilmeal for Beef Cattle and Sheep, by P. Gerlough (pp. 17, 18), and Soybeans and Soybean Oilmeal for Pigs, by W. L. Robison (pp. 18-22) (all Ohio Expt. Sta.); Soybean Products as a Feed for Poultry, by A. R. Winter (pp. 22-24), The Soybean as Food for Man, by J. F. Lyman (pp. 25-30), The Effect of Soybeans on Soil Productivity, by J. A. Slipper (pp. 42-44), and Inter-relations of the Soybean Enterprise in a Farming System, by J. H. Sitterley (pp. 48-55) (all Ohio State Univ.); and Soybeans in the Northeast, by R. G. Wiggins (pp. 33-37).

Papers presented at the nineteenth association meeting held in Madison, Wis., September 11 and 12, 1939, included Soybeans in Central Wisconsin on Light Sandy Soils, by A. R. Albert (pp. 10-12); Soybeans Need Inoculation With Good Strains of Bacteria, by W. W. Umbreit (pp. 13, 14), The Preparation and Feeding Value of Soybean Silage, by G. Bohstedt (pp. 29-34), The Effect of Solvents and Heat on the Nutritive Value of the Proteins of Soybeans, by M. Johnson, H. T. Parsons, and H. Steenbock (pp. 44-46), Putting Up Grass or Legume Silage, by F. W. Duffee (pp. 47, 48), and The Effect of Cooking on the Proteins of Edible Soybeans, by H. T. Parsons, A. L. Marlatt, and G. M. Briggs (pp. 51-53) (all Univ. Wis.); Soybean Meal for Growing Chicks, by J. G. Halpin (pp. 18-21); Extending the Soybean Belt Northward, by E. J. Delwiche (pp. 22-26); Soybeans—The World Around, by W. J. Morse (pp. 39-44), and Recent Progress of the U. S. Regional Soybean Industrial Products Laboratory, by R. T. Milner (pp. 56-60)

* *Bol. Soc. Broteriana*, 2. ser., 11 (1936), pp. 49-86, pls. 7.

(both U. S. D. A.); and *The Merits and Possibilities of Green Vegetable Soy Beans as Food*, by T. A. Rogers (pp. 65-69).

Sugar beets in Michigan (*Michigan Sta. Cir.* 175 (1940), pp. 53+[2], figs. 29).—Current information on effective sugar beet production practices, based extensively on station research and experience, deals with the status of the crop, its soil and fertility needs, cultural and harvesting requirements and machinery, sugar beets and byproducts as stock feed, diseases of the crop, and production costs.

Sweetpotato plant production in Mississippi, W. S. ANDERSON (*Mississippi Sta. Bul.* 349 (1940), pp. 20, figs. 15).—A revision and enlargement of Bulletin 325 (E. S. R., 80, p. 479).

The influence of the awns upon the rate of transpiration from the heads of wheat, H. G. GAUCH and E. C. MILLER. (Kans. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 6, pp. 445-458, figs. 5).—Effects of removal of awns upon the transpiration rate of heads of Pusa 52 \times Federation wheat were studied, 1935-37, with a modification of the Freeman method (E. S. R., 20, p. 733) in greenhouse cultures. The average ratio of amount of water transpired from seven sets of intact heads that later were de-awned to seven sets of heads serving as controls was 0.976. In 105 experiments made as early as 2 min. after de-awning and as late as 34 days after and from early flowering to complete ripeness of grain, the ratio of amount of water transpired from de-awned to awned heads averaged 0.61. De-awned heads transpired 38.9 percent less than did awned heads. Curves of transpiration of awned and de-awned heads paralleled each other throughout the experiments, showing a maximum transpiration rate at flowering and another as maturity approached. The rate of transpiration from heads of wheat evidently is decreased by de-awning, but the significance of such transpiration in the metabolism of the plant seemed unknown.

HORTICULTURE

[**Horticultural studies by the U. S. Department of Agriculture**] (*U. S. Dept. Agr., Sec. Agr. Rpt.*, 1940, pp. 149-150, 152).—Brief mention is made of studies relating to crop plant improvement by breeding, the use of growth-promoting substances in delaying the dropping of apples and hastening the rooting of pecan transplants, the icing of refrigerator cars used in transporting citrus fruits, the treatment of southern-grown tomato plants for the control of diseases and for stimulating better growth, effect of nutrient deficiencies on the vitamin C content of citrus fruits, the effect of N on the color of apples, the effect of B in preventing corky brown spots in the apple, and the improvement of the Easter lily.

[**Horticultural studies by the Bureau of Plant Industry**] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt.*, 1940, pp. 9, 10, 18, 19, 20, 21, 22, 23, 26, 27).—Brief progress statements are made on the following studies: Testing of fish-poison plants and devil's shoestring for insecticidal value (coop. P. R. Expt. Sta.). native canaigre and sumac as sources of tannin, improvement of hop varieties, effect of N fertilizers on the color of apples, effect of growth-promoting substances in retarding apple drop, effect of CO₂ on the ripening of stored apples, introduction of new peach varieties, refrigeration of oranges in transit, value of time elapsed after full bloom as an index to the maturity of highly colored apples, pruning of vinifera grapes, ethylene as a stimulus to early fruiting of the pineapple, breeding of strawberries resistant to red stele disease, introduction of new raspberries and blackberries, relation of dormancy to hardiness in the tung tree, treatment of pecan transplants with indole-3-butyric acid to stimulate

renewed root development, handling of tomato plants for long transit, breeding of wilt-resistant tomatoes and cabbages (partly coop. Wis. Sta.), testing of vegetables for the Great Plains area, breeding of Easter lilies, selection of double-flowered stocks, effect of gaseous emanations from fruit on the life of cut flowers, introduction of new plants, and the testing of rubber-yielding plants.

[**Horticultural studies by the Oklahoma Station**] (*Oklahoma Sta. Bien. Rpt. 1939-40*, pp. 101, 102, 104, 105, 106-113, 114-127, figs. 9).—Brief reports of progress are presented on the following investigations by F. B. Cross, E. L. Hartman, H. B. Cordner, F. A. Romshe, G. E. Gray, J. E. Webster, V. G. Heller, M. Afanasiev, and L. G. McLean: Effect of growth-promoting substances on the rooting of cuttings, testing of early-flowering chrysanthemums, improvement of the lima bean, use of aster cloth houses for the protection of tomato plants, selection of pea varieties for freezing storage, testing of watermelon varieties for wilt resistance, testing of vegetables, tree fruit, and small fruit varieties, irrigation of sweet corn and tomatoes, comparison of overhead and furrow methods of irrigation, improvement of overhead irrigation equipment, fertilizer requirements of vegetables, comparison of modified leader and open-center types of pruning, soil management of orchards, methods of transplanting peach trees, factors involved in the uneven ripening of the Concord grape, effect of high soil temperature on strawberry roots, comparative ease of cracking of pecan varieties, culture of pecan groves, testing of the gravel-nutrient culture system of growing flower plants, spacing of greenhouse tomato plants, effect of different concentrations of salts and alkalis in water applied to greenhouse crops, improved methods of handling seed of native trees and shrubs, and methods of establishing stands of red cedar.

[**Horticultural studies by the South Dakota Station**] (*South Dakota Sta. Rpt. 1940*, pp. 16, 55-60, fig. 1).—Included are brief reports on investigations by L. D. Hiner in the improvement and culture of *Ephedra sinica*; fruit breeding, breeding of hardy double and hardy thornless roses, and development of triploid apples by crossing tetraploid with diploid forms, by N. E. Hansen: breeding of high vitamin C-content tomatoes, testing of Manchurian walnut, and effect of ground covers on the development of shelterbelt trees, by L. L. Davis; and the development of sweet corn hybrids and the testing of vegetable varieties, by S. A. McCrory.

[**Horticultural studies by the Texas Station**]. (Partly coop. U. S. D. A., Univ. Wis., Ill. Expt. Sta., et al.). (*Texas Sta. Rpt. 1939*, pp. 21-23, 28-36, 120, 121-122, 148-149, 160-161, 166, 167, 209-210, 214-216, 225, 233-234, 247-250, 251-254, 255-256, 263, 272-274, 274-275, 276-279, 279-282).—In the usual manner (E. S. R., 82, p. 481) there are presented brief progress reports on horticultural investigations at the main and branch stations of work by S. H. Yarnell, J. F. Rosborough, J. C. Ratsek, B. S. Pickett, H. F. Morris, W. H. Friend, E. Mortensen, J. F. Wood, H. M. Reed, U. A. Randolph, W. S. Flory, J. C. Walker, L. R. Hawthorn, H. B. Parks, A. H. Alex, R. H. Stansel, J. J. Bayles, W. H. Dameron, J. P. McCollum, S. S. Ivanoff, R. H. Wyche, and P. A. Young. Among studies discussed are varietal, cultural, and breeding tests of various fruits, vegetables, and ornamentals; oak breeding and propagation; effect of environment on head shape of cabbage; effect of colchicine in doubling the chromosomes in Copenhagen cabbage; treatment of seeds with chemicals in dust form; chromosomal determinations of species of *Cooperia*, *Hymenocallis*, *Habranthus*, and *Zephyranthes* and rose hybrids; propagation and utilization of grapes; testing of canaigre tubers as sources of tannin; propagation and storage of rose plants; reforestation of slash pine; citrus orchard reclamation; effect of a growth-promoting substance containing fluorescein dye on the ripening of grape-

fruit; propagation and progeny tests with citrus; effect of girdling on the development of citrus fruit; wound protectants for citrus trees; propagation of date palms; papaya utilization; pruning of tomatoes; methods of breaking dormancy in the onion; and irrigation of spinach.

[Horticultural studies by the Utah Station] (*Utah Sta. Bul.* 294 (1940), pp. 13, 14, 60, 62-68, figs. 11).—Information is presented on the progress of studies relating to methods of planting tomatoes; new varieties and selections of tomatoes; cultural and harvesting practices for canning peas; variety testing of tree and berry fruits; breeding of apricots, peaches, cherries, and plums; soil management of orchards; and rootstocks for the cherry.

[Horticultural studies by the West Virginia Station]. (Partly coop. U. S. D. A.). (*West Virginia Sta. Bul.* 298 (1940), pp. 11-15, 16-17).—Information is presented on the progress of studies by R. S. Marsh, W. H. Duis, W. H. Childs, R. H. Sudds, D. S. Brown, R. B. Dustman, I. J. Duncan, K. C. Westover, and E. P. Brasher on the relation of soil management to winter injury in the peach; raspberry varieties; value of mulch for raspberries; improvement of the blueberry; soil management of orchards; rootstocks for apples; removal of soot deposits from apples; pruning of the cherry; sodium thiocyanate sprays as a factor in increasing the color of apples; variety tests of vegetables; starter nutrient solutions for tomatoes; training of tomato plants; the deleterious effect of wax coatings on transplanted cabbage; effects of hardening treatments on tomatoes, peppers, and other vegetables; and the value of rye and vetch green manure crops for cabbage and tomato culture.

Soil as a rooting medium for cuttings, W. L. DORAN. (Mass. Expt. Sta.). (*Amer. Nurseryman*, 72 (1940), No. 5, pp. 7-8).—Softwood cuttings of most deciduous species tested rooted in larger percentages in sandy soil than in sand. Among the few which rooted better in sand were *Magnolia soulangeana*, *Corylopsis pauciflora*, and *Buddleia alternifolia*. August cuttings of American holly rooted better in sand-peat than in sandy soil. *Viburnum carlesi* rooted well in sand if treated with indolebutyric acid. In general, the best rooting was obtained with treated cuttings placed in sandy soil, although treatment had no more effect than did the proper selection of the rooting medium.

Tree wound dressings, P. E. TILFORD. (Ohio Expt. Sta.). (*Natl. Shade Tree Conf. Proc.*, 16 (1940), pp. 41-51, figs. 4).—Of various materials tested, asphaltum dissolved in a light volatile hydrocarbon solvent was most satisfactory as a wound dressing, consistently stimulating callus formation during the first year following treatment. Water-asphaltum emulsion also stimulated callusing, but not as greatly as did liquid asphaltum. Asphaltum dissolved in creosote was distinctly injurious to elm, maple, and hickory. Bordeaux-linseed oil paint retarded callus formation. Waterglass was neither injurious nor beneficial and weathered off rapidly. Avenarius carbolineum caused severe injury to maple, elm, and oak, even when applied 1 mo. after wounding. Lanolin containing indole butyric acid did not stimulate callusing, and lead paint and varnish were both neutral with respect to healing.

Grafting-wax melter, B. G. SITTON and E. P. AKIN (U. S. Dept. Agr. Leaflet 202 [1940], pp. 5, figs. 2).—The construction and operation is discussed of a new apparatus developed at the U. S. Pecan Field Laboratory.

[Vegetable crop studies by the New Jersey Stations] (*New Jersey Stat. Rpt.* 1940, pp. 16-17, 56-58, 59-60, 62-64, fig. 1).—Among studies the progress of which is discussed are the superiority of liquid fertilizer, tomato breeding, the relation of phosphorus concentrations in the nutrient supply to the growth of the tomato, the fertilization of the tomato, mulching of the tomato, value of cover crops in tomato rotations, effect of deep soil treatment upon asparagus root development, pepper breeding, effect of nitrogen fertilizers in correcting over-

liming injury, and effect of cover crops and farm manure in conserving soil and water.

[Vegetable crop studies by the Cornell Station] ([*New York*] *Cornell Sta. Rpt. 1940*, pp. 144, 177-178, 179-183).—Included are progress reports on studies by R. A. Emerson, H. C. Thompson, R. H. White-Stevens, W. J. Jacob, P. H. Wessels, J. E. Knott, R. D. Sweet, G. J. Raleigh, R. L. Carolus, O. A. Lorenz, H. Platenius, and E. M. Anderson in celery breeding, asparagus spacing, cultivation requirements of vegetables, fertilizer needs of Long Island vegetables, adaptation and soil management of crops on muck soils, effect of manganese sulfate on muck-land onions, fertilizer for cauliflower in Delaware County, use of dolomitic limestone for the control of chlorosis due to magnesium deficiency, effect of boron in preventing internal break-down of beets, relation of soil moisture to availability of boron, lettuce handling and storage, effect of variety and ecological conditions on pungency of various species of *Allium* and *Brassica*, breeding of lettuce, relation of the temperature of the air to that within lettuce heads, and relation of soil moisture to lettuce growth.

Disease-resistant varieties of vegetables for the home garden, R. J. HASKELL and V. R. BOSWELL (*U. S. Dept. Agr. Leaflet 203* [1940], pp. 8).—This leaflet describes briefly some of the diseases that have caused heavy losses to vegetable growers and discusses resistant varieties.

The phosphorus fertilization of vegetables [trans. title], S. GERICKE (*Gartenbauwissenschaft*, 15 (1940), No. 2, pp. 159-183, figs. 7).—In a total of 161 experiments with phosphorus fertilizers applied to different vegetables there was recorded a definite response, despite the fact that most of the tests were conducted on soils of high phosphoric acid content and in many cases large amounts of stable manure were used. The larger the applications of phosphates, in general the larger were the resulting yields.

Vegetable crops affected by boron deficiency in eastern Virginia, E. R. PUEVTS and W. J. HANNA (*Virginia Truck Sta. Bul. 105* (1940), pp. 1719-1742, figs. 9).—Stating that B deficiency, as evidenced by growth response to borax or by malnutrition symptoms, has been observed in at least 16 vegetable crops in eastern Virginia, the authors present data showing that applications of borax have in several areas resulted in increased yields or better quality with a majority of vegetables under test. Although certain of the light Norfolk soils were found extremely deficient in B, the condition is not general with the majority of eastern Virginia truck crop soils. Vegetable crops are classified according to their tolerance to applied borax. In general, assuming normal rates of fertilizer application, the addition of 10 lb. of borax per ton of fertilizer is deemed a safe practice for all vegetable crops in this region. Borax should never be applied alone as it is practically impossible to secure uniform distribution, and with any system care should be taken to avoid concentrating borax in the soil adjacent to the seeds or roots. On soils where any one crop is affected by B deficiency it is suggested that borax be applied at the rate of not more than 10 lb. per acre for the following crops: Beets, carrots, cauliflower, celery, corn (field and sweet), eggplant, kale, lettuce, mustard, pepper (sweet), potatoes, radish, sweetpotatoes, tomatoes, and turnips.

The quantity of pericarp in several hybrid and inbred strains of sweet corn, W. G. GAESSLER, R. M. HIXON, and E. S. HABER. (*Iowa Expt. Sta.*). (*Iowa State Col. Jour. Sci.*, 14 (1940), No. 4, pp. 379-383).—Utilizing a method, described in some detail, for separating the pericarp of sweet corn from other tissues of the kernel at the edible stage, it was found that inbred and hybrid strains differ in the quantity of pericarp at the canning stage. Strains classed as very tough on chewing contained 50 to 100 percent more pericarp than tender strains. The

kernels of tender, medium tender, tough, and very tough strains contained, respectively, 4 to 5, 5 to 6, 6 to 7, and over 7 percent pericarp on a dry weight basis.

A developmental analysis of kohlrabi and cabbage stems, A. L. HAVIS. (Ohio Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 6, pp. 459-470, figs. 4).—In developing kohlrabi and cabbage stems cell diameter in the pith and cortex was compared with pith and also with stem diameters. The greater size of the kohlrabi stem was due largely to a greater number of cells, although some of the difference was evidently due to cell size. The pith, of which the edible kohlrabi is largely composed, grew at the same rate, relative to the entire stem, throughout its development and at the same relative rate as that of the cabbage pith to its stem. There was no sharp point of demarcation between the cell division stage and the cell enlargement stage in the growth of the pith and cortex of these stems. The innermost cells of the pith increased most rapidly in size, and in the kohlrabi were the first to become very meristematic again after a definite size was reached. By use of grafting tests with kohlrabi and cabbage stems, it was found that the cells of each plant retained their own morphogenetic nature even though they developed in direct contact with each other.

Effect of roasting and scalding pimiento fruits in preparation for canning on the subsequent germination of the seeds, H. L. COCHRAN. (Ga. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 3, pp. 223-229, figs. 2).—Over a 2-yr. period the average germination for seeds from untreated, roasted, or oil-scalded pimiento fruits were 90.7, 14, and 14.5 percent, respectively. The two treatments are said to be used for removing the outer skins of the fruits in preparation for canning. Seeds of the fruits passing through the roasters were exposed to an average internal temperature of 71° C., and those from the scalding vats had an average internal temperature of 60° but were 12 sec. longer in the oil. In addition to low germination a considerable percentage of the seedlings arising from the seed from the treated fruits showed abnormalities such as adhering seed coats, baldheads, and single cotyledons.

Tomato hybridization [trans. title], J. HACKBARTH (*Gartenbaucwissenschaft*, 15 (1940), No. 1, pp. 36-47, figs. 6).—The yield of tomato hybrids resulting from crosses of *Solanum racemigerum* with cultivated tomatoes showed that fruit size is the most difficult goal to attain, since the small size of the species parent appeared to dominate the crosses. However, by careful selection in the later generations some crosses were found with fruits about two-thirds of the size of the cultivated parents. Some of the hybrids outyielded Bonny Best and ripened earlier. Certain of the strains bore fruit of good quality with definite commercial possibilities.

Minnesota fruit breeding farm report for 1940, W. H. ALDERMAN and F. E. HARALSON. [Minn. Expt. Sta.], (*Minn. Hort.*, 69 (1941), No. 1, pp. 5, 18).—A record is presented of progress in the improvement of the apricot, plum, peach, cherry, apple, grape, strawberry, and other fruits, with comments on some of the outstanding seedlings.

Home orchards in Mississippi, T. E. ASHLEY (*Mississippi Sta. Bul.* 350 (1940), pp. 38, figs. [29]).—General information is presented on the establishment of orchards, training and pruning, soil management, fruit thinning, insect and disease control, and varieties.

[Pomological studies by the New Jersey Stations] (New Jersey Stas. Rpt. 1940, pp. 15-16, 44-DE, 47, 48-51, 52-53, 54, 54-55, fig. 1).—Included in this general progress report is information relating to studies of apple breeding, apple rootstocks, effects of liming apple orchard soils, timing and selection of sprays to reduce the arsenical residue on fruits and vegetables, role of lime in spray mixtures in relation to arsenical and copper injury, control of biennial bearing in apples by blossom thinning or spraying with oils, varietal differences in resist-

ance to early fall frosts of apple foliage, date of bloom in the Elberta peach and Stayman apple in 1:40, peach varieties and breeding, classification of peach varieties on the basis of leaf characters, catechol tannin content of peach fruits, chromosomal variations in the peach, rootstocks for peaches, methods of applying potassium to peach trees, fertilization and soils for blueberries, varieties of blueberries, productive life of blueberry canes, methods of harvesting cranberries, mulching of red raspberries, and the breeding of strawberries.

[Pomological studies by the Cornell Station]. (Partly coop. U. S. D. A.). ([New York] Cornell Sta. Rpt. 1940, pp. 157-164).—Among studies discussed are those by R. M. Smock, A. Van Doren, A. J. Heinicke, D. Boynton, W. Reuther, E. F. Savage, L. J. Edgerton, M. B. Hoffman, L. H. MacDaniels, E. M. Hildebrand, and W. H. Childs on the effects of controlled atmospheres on the keeping quality of apples and other fruits; the cause and control of bitter pit in apples; the relation of climatic, soil, and cultural factors and maturity to the behavior of apples in storage; effect of low but nonfreezing temperatures on the keeping quality of apples; methods of preventing shriveling of apples in storage; influence of soil type on the oxygen and carbon dioxide content of the soil; effect of prolonged flooding on top growth and nutrient absorption by the Northern Spy apple tree; influence of soil type on the potassium supply of the fruit tree; seasonal fluctuations of soil moisture in orchards; influence of soil acidity on growth of budded apple trees and seedlings; effect of mulch on growth and fruiting of the apple; effect of various bactericides and fungicides on the set of apple blossoms; duration of pruning effects in bearing trees; effect of heavy applications of barnyard manure in stimulating unproductive fruit trees; soil management in the Champlain and Hudson River Valleys with special reference to color and fruit drop of the apple; effect of hormone sprays on set of fruit and on preharvest drop; and the photosynthetic activity of apple foliage under natural conditions.

Juvenile and old growth in the apricot and other fruits [trans. title]. F. PASSECKER (*Gartenbauwissenschaft*, 14 (1940), No. 5, pp. 614-625, figs. 11).—Stating that old and young types of growth may be found in various species of fruit, the author reports that in the apricot the leaves of the juvenile form are smaller, shorter petioled, and rougher due to short stiff hairs. Constant age forms of apricot were obtained by vegetative propagation. Juvenile wood cuttings rooted more freely than did those taken from the older wood.

Winter growth in the vegetative buds of the Wagener apple, H. P. BELL (*Canad. Jour. Res.*, 18 (1940), No. 12, Sect. C, pp. 585-590, fig. 1).—Measurements of vegetative buds collected at Kentville, N. S., twice a month from September 1938 to March 1939 showed a slow and continuous growth in length within the bud throughout the winter months. The data were analyzed statistically and found significant.

Spraying apples for blossom removal, J. R. MAGNESS, L. P. RATJER, and C. P. HARLEY. (U. S. D. A. et al.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 141-146, fig. 1).—At Kearneysville, W. Va., the application of tar distillate oils or DNO spray at three stages of flower development, (1) buds in delayed dormant condition, (2) early-cluster bud, and (3) early-pink stage, all reduced the set of fruit, but the first treatment was much less effective than the others. There was no clear-cut difference in effectiveness of the DNO and the tar oil distillate sprays. Varieties appeared to differ in their response to a given treatment. Although the sprays tended to injure the young leaves, there was a rapid recovery and, in addition, there was abundant fruit-bud formation where the spraying was effective in reducing markedly the current set of fruit. In Golden Delicious there was increased russeting of the fruit.

In similar studies at Wenatchee, Wash., in which only tar oil distillate was used there was again noted much varietal difference in response to sprays.

Delicious, Winesap, and King David were effectively prevented from setting fruit by a spray at the late-cluster bud stage, and there was a definite indication of increased fruit-bud formation for the next season.

Respiration and maturity in peaches and plums, E. R. ROUX (*Ann. Bot. [London]*, n. ser., 4 (1940), No. 14, pp. 317-327, figs. 6).—In the case of Peregrine peaches and Kelsey plums, collected at different stages from the small green to the fully mature, it was found that in both varieties the very young fruits have an early and pronounced climacteric. Fruits of intermediate age had a very delayed climacteric and kept longest in storage. The stage of maximum length of storage life coincided with the beginning of the period of most rapid increase in size of fruits. There was an inverse relation between longevity and the rate of respiration.

The response of the plum grown under hillculture conditions to modifications in cultural treatment, J. M. AIKMAN and H. E. BREWER (Iowa Expt. Sta. and U. S. D. A.). *Iowa State Col. Jour. Sci.*, 14 (1940), No. 4, pp. 385-391, pl. 1, figs. 3).—At the Hillculture Experimental Farm in Davis County, Iowa, five varieties of commercial plums were planted in 1938 on contour furrows on steep eroded Lindley and Clinton soils. There was noted a well defined variety difference in survival and growth, with Superior doing best and Tonka the poorest. Responses to type of culture were greater in the second than in the first year, due apparently to reserves in the trees when planted. The three treatments, chisel furrow, two furrows kept tilled above, and cultivation with mulch appeared to result in adequate growth response and at the same time provide soil protection and improvement. Complete cultivation gave the greatest growth but soil losses rendered this system impracticable. Fertility, degree of erosion, aspect and degree of slope, and competition with original vegetation were all important factors in the choice of the best cultural method to use.

Blueberries, G. M. DARROW (*U. S. Dept. Agr. Leaflet 201* (1940), pp. 8, fig. 1).—Six types or species of blueberries that are marketed extensively in different sections of the United States are discussed briefly as to location and importance. Information is presented on cultivated blueberries, their development, principal varieties, cultural management, propagation, etc.

A preliminary report on the training of boysenberries, T. E. ASHLEY (Miss. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 597-598).—Observations on plants grown on (1) a 2-wire vertical trellis, (2) a 2-wire horizontal trellis, (3) stakes, and (4) no support, showed the highest average total yield per plant for the vertical trellis and the lowest for the untrained plants. The plants on the horizontal trellis also gave satisfactory though somewhat smaller yields.

Correlations between leaf area and leaf weight and between leaf weight and fruit production of red raspberries, M. A. KHANMAI and W. S. BROWN (Oreg. State Col.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 589-592).—In the Chief and Newburgh varieties correlations of 0.9821 ± 0.0027 , 0.8498 ± 0.0189 , and 0.9829 ± 0.0087 were established between the size and weight of leaves of fruiting laterals in three respective positions, (1) from the top of canes above 6 ft. from the ground, (2) from the lower part of canes up to 6 ft. where leaves were only partially exposed to sunlight and were not very uniform in texture, and (3) from the lower 6 ft., with full exposure to the sun and with uniform texture. Using leaf weight as a measure of the amount of foliage, high positive correlations were established between leaf area on laterals and weight of fruit produced by such laterals. No definite correlation was established between the number of fruits produced on a lateral and the size of leaves borne on the same lateral. There was some evidence that Newburgh leaves are from 17 to 18

percent more efficient than those of Chief as measured by weight of fruit produced.

Variety comparisons of raspberries with respect to yield, hardiness, and fruiting period. I. C. HAUT. (Md. Expt. Sta.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 599-603).—Observations on six black and four red varieties of raspberries planted in 1936 and grown under good cultural care at Rohrer'sville, Md., showed no significant difference in yield in 1937 between the four blacks, Bristol, Black Beauty, Cumberland, and Quillen. Naples yielded significantly lower than all other blacks, and Logan significantly lower than Bristol or Black Beauty. In 1938 Bristol yielded significantly higher than other blacks, without significance between other varieties except that Naples yielded significantly less fruit than all others except Quillen. There was no significant difference in the 1938 yields of four red varieties, but in 1939 injury from a premature freeze the preceding November affected the several reds differently, Newburgh and possibly Taylor showing more damage than Latham or Chief. As to fruiting period, Naples, Logan, and Bristol ripened at a slightly faster rate than Cumberland, Black Beauty, and Quillen. Despite the fact that the harvest of Naples in 1937 and 1938 was approximately 4 days later than the other blacks, it was completed at the same time. Among reds, Chief ripened at a slightly faster rate than the other three, but the difference was only about 2 days. Apparently the difference in ripening periods recorded in localities farther north tends to disappear under Maryland environment.

Strawberry culture: South Atlantic and Gulf Coast regions. G. M. DARBOW (U. S. Dept. Agr., *Farmers' Bul.* 1026, rev. (1940), pp. [2]+40, figs. 26).—This is a revision of the edition of 1919 (*E. S. R.*, 40, p. 838). Among new facts discussed are the effects of length of day and temperature on flower bud formation and varietal adaptation, new varieties, and new developments in the control of various pests.

Strawberry growing in Kansas. R. J. BARNETT (*Kansas Sta. Cir.* 203 (1941), pp. 20, figs. 10).—General information is given with regard to varieties, soils, culture, propagation, planting, fertilizers, renovation, control of pests, harvesting, marketing, and processing.

Seed size in strawberries. G. M. DARBOW. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 564-566).—Based on the weights of 100 seed samples, those of the diploid species *Fragaria vesca* were found the smallest and those of *F. chiloensis*, *F. cuneifolia*, and *F. virginiana*, all octoploids, were the largest, averaging about twice the weight of the diploid seeds. Although the seed size of cultivated varieties varied greatly, only one, Marshall, had seed larger than that of the octoploid *F. cuneifolia*. Klondike was notable for its very small seeds. Selfed seedlings of Dorsett averaged about the same in seed size as Dorsett itself. Blakemore berries averaged about 1.3 percent of seed of the total weight of the fruit.

A quantitative spectrographic determination of eight elements in young leaves of the Delaware grape. A. T. MYERS, B. C. BAUNSTETTER, I. W. DIX, and C. A. MAGOON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 645-649).—Where Delaware vines were grown under four cultural treatments (1) mulch plus nitrate, (2) mulch plus NPK, (3) clean cultivation plus nitrate, and (4) clean cultivation plus NPK, a statistically significant higher content of Mg and Ca in vines was found under treatment 2. There was a significantly higher content of Ca, Cu, and K in Delaware leaves than in Concord leaves receiving the same treatment, but no marked difference in Mg, Mn, Al, Fe, and P. Delaware leaves were higher than Ontario in Mg, Ca, and Al and significantly lower in Mn and P. It is pointed out that the observed differences may not

have any biological significance, but do show differences between varieties in their capacity to absorb certain nutrient elements through their roots.

Studies on the adaptability of some American grape varieties to southern conditions when grown on their own roots and on certain stocks, N. H. LOOMIS, J. R. MAGNESS, and C. A. MAGOON. (U. S. D. A.). (*Amer. Soc. Hort. Sci. Proc.*, 36 (1939), pp. 639-644).—Of 10 grape rootstocks tested with 10 scion varieties at Meridian, Miss., Dog Ridge and Aramon \times [Vitis] rupestris Ganzin 2 were rated as very good and Solonis \times Othello 1613 as good. The others rated only poor to fair. Only 21 of 58 varieties tested on their own roots showed 51 percent or more survival after the 6-yr. test, and of these 21 only 8, namely, Champanel, Champion, Delaware, Extra, Herbemont, Lenoir, Marguerite, and R. W. Munson, had an average yield of 5 lb. of fruit per living vine in the sixth year.

Forty varieties of American grapes tested for resistance or susceptibility to chlorosis, G. A. BEACH and L. R. BRYANT (Colo. Farm. Bul. [Colorado Sta.], 3 (1941), No. 1, p. 11).—In a study extending over a period of more than 5 yr. and involving more than 40 varieties of grapes it was found that 20, including such well-known varieties as Brighton, Delaware, Agawam, and Vergennes, were resistant or relatively chlorosis free. Only a small number were so severely affected as to be of no value.

Studies in tropical fruits.—IX, The respiration of bananas during ripening at tropical temperatures, C. W. WARDLAW and E. R. LEONARD (Ann. Bot. [London], n. ser., 4 (1940), No. 14, pp. 269-315, figs. 23).—There was recorded during ripening and senescence a succession of well-defined phases, designated as the preclimacteric, climacteric, postclimacteric, eating ripe, and overripe or senescent stage, all characterized by well-defined respiration activities. For example, the climacteric phase, in which the curve of respiration rises steeply to a peak, was characterized by a rise in pulp temperature, by a sharp decline in the internal concentration of oxygen, and a corresponding rise in the internal content and concentration of carbon dioxide. This was a stage of rapid change from a lower to a higher level of metabolic activity. Ripening was initiated in the central placental region and proceeded outward toward the skin.

Preliminary note on the use of β -indoleacetic acid for rooting sour orange cuttings [trans. title], C. R. MARQUES DE ALMEIDA (Bol. Soc. Brottiana, 2. ser., 13 (1938-39), pp. 117-121, pl. 1; Eng. abs., p. 120).—Rooting was induced on hard cuttings with a 1:10,000 concentration of the growth substance.

Studies of the root system of Coffea arabica L.—II, Growth and distribution in Catalina clay soil, J. GUISCAFRÉ-ABRILLAGA and L. A. GÓMEZ (Jour. Agr. Univ. Puerto Rico [Univ. Sta.], 24 (1940), No. 3, pp. 109-117, figs. 3; Span. abs., pp. 115-117).—Continuing this investigation (E. S. R., 79, p. 631) and using a soil very deficient in N, P, and K, 95 percent of the roots were found in the upper 12 in. of soil. A fixed ratio, approximately 3:1, of tops to roots was indicated, and a heavy and vigorous top was correlated with an extensive root system. The diameter of the trunk was found a more accurate index of the size of the root system than was the lateral spread of the branches or the height of the tree.

Stimulation of growth in juvenile mangosteen plants, C. L. HOBY. (P. R. Expt. Sta.). (Jour. Agr. Res. [U. S.], 61 (1940), No. 5, pp. 397-400, fig. 1).—Stating that normal growth in young mangosteen plants is so unthrifty that few develop past the juvenile stage but that the survivors attain a satisfactory degree of vigor, the author reports that the irrigation of young plants with nutrient solution containing yeast extract stimulated greatly their development. In the case of plants growing in sphagnum moss, those supplied with yeast made 75.8 percent more leaf area in the first 10 mo. than did plants without yeast. Stimulation became less as time advanced beyond the 10 mo., suggesting that the

larger plants are able to produce a sufficient quantity of growth-promoting substance, possibly vitamin B₁, to meet their current needs. Growth of all plants in the nutrient cultures, whether or not supplied with yeast extract, was much better than in soils.

[Floricultural studies by the Cornell Station] ([*New York*] *Cornell Sta. Rpt. 1940*, pp. 117, 137-139).—Included are progress reports of studies by L. Knudson, K. Post, E. P. Hume, C. Weddle, C. Keyes, H. T. Skinner, A. M. S. Pridham, R. C. Allen, and K. E. Wheeler in orchid germination, effect of increasing the daily photoperiod on the growth and flowering of greenhouse plants, cultural requirements of the gardenia, propagation of rhododendrons and other ericaceous plants, factors affecting shoot growth and flower-bud set in azaleas and rhododendrons, methods of watering greenhouse plants, cultural requirements of the rose, and the use of organic materials in preparing soil for flowering plants.

Dahlia variety test—1940, H. L. COCHRAN, D. D. LONG, M. LAMOTHE, and T. L. BISSELL (*Georgia Sta. Cir. 125* (1940), pp. 11, figs. 7).—Brief information is presented on promising new varieties and seedlings included in the 1940 trials and on the control of the stalk borer.

Nutritional studies with orchids, O. R. EVERS and A. LAURIE (*Ohio Sta. Bimo. Bul. 207* (1940), pp. 166-173, figs. 3).—Young, unflowered *Cattleya* orchid plants potted in three materials—osmunda fiber, haydite, and silica gravel—and supplied periodically with chemical solutions grew exceptionally well, making better leaf and root development than the control plants. The majority of plants in osmunda fiber grew better than those in haydite or gravel. Haydite gave somewhat better results than silica gravel. No outstanding results could be noted from the application of vitamin B₁ solutions to young, unflowered *Cattleya* plants. In the case of mature, flowering *Laeliocattleya* plants, response to cultural solutions was not as striking as with the younger plants, partly because of a more severe check in transplanting. Those plants which remained healthy and vigorous made strong root and shoot growth. Attempts to transfer seedlings directly from the flasks to sand with periodic applications of chemical solutions met with only limited success due to moisture control difficulties and damping-off disease. The seedlings which survived were larger and darker green than those on osmunda fiber. The addition of vitamin B₁ to the cultural solution again gave no evidence of value. Good results secured with *Cypripedium*, *Dendrobium*, and *Oncidium* plants grown in inert media with chemical solutions further indicated the possibilities of this form of culture.

[Ornamental horticultural studies by the New Jersey Stations] (*New Jersey Stas. Rpt. 1940*, pp. 17, 98-99, 100-101).—Among studies discussed are the causes of poor growth of greenhouse crops, advantages of soilless culture in the production of greenhouse crops, effect of root temperatures on the flowering of gardenias, calcium and phosphorus nutrition of roses, and the effect of winter droughts on the rhododendron and other broad-leaf evergreens.

Growing ornamental greenhouse crops in gravel culture, A. LAURIE and D. C. KIPLINGER (*Ohio Sta. Bul. 616* (1940), pp. [1]-49, figs. 24).—Outlining briefly the history of the development of growing plants with nutrient solutions, the authors discuss the equipment and operation of greenhouses devoted to the soilless culture of ornamental plants. Among points covered are the pumping apparatus, piping, media, preparation and handling of the nutrient solutions, and requirements of various crops such as roses, carnations, chrysanthemums, gardenias, sweet peas, lilies, etc. Dormant-budded roses were found best for gravel culture and should preferably be planted in January or February. Frequent syringing of roses was safer in gravel than in soil, since there was no danger of creating too moist a medium. Stocks, snapdragons, pansies, feverfew, asters, Boston yellow daisies, sweet peas, and chrysanthemums produced more and better

flowers in gravel than in soil. Carnations required less frequent applications of solutions per day than many of the other plants.

FORESTRY

Report of the Chief of the Forest Service, 1940, E. H. CLAPP (*U. S. Dept. Agr., Forest Serv. Rpt., 1940, pp. IV+42*).—Included in this general administrative report is information pertaining to the relation of forests to national defense and general welfare, forest problems, the significance of private ownership, the status of the national forests, planting activities, protection from fire and insect and fungus pests, progress of research activities, etc.

[**Forestry studies by the U. S. Department of Agriculture**] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1940, pp. 177-181*).—Information is given on forest production necessary to the defense program, importance of forests in the national life, the place of forestry in agriculture, aims of the forest program, need of increased public ownership of forest lands, and forest fire control.

[**Forestry studies by the New Jersey Stations**] (*New Jersey Stat. Rpt. 1940, pp. 76-77*).—Progress reports are given on studies in woodland management, possibilities in production of timber on farm lands, and the marketing of farm-grown timber.

[**Forestry studies by the Cornell Station**] (*[New York] Cornell Sta. Rpt. 1940, pp. 141-142*).—Reports are presented on the studies by E. F. Wallihan, L. G. Cox, and A. B. Recknagel on germination of forest tree seeds and the establishment, culture, and development of forest plantations.

[**Forestry studies by the West Virginia Station**] (*West Virginia Sta. Bul. 298 (1940), pp. 33-35*).—Included are brief reports of progress of studies by W. C. Percival, E. A. Marten, and L. Besley in forest management and utilization, rate of decay of different types of forest leaves, and rates of growth in different forest types.

Soil-fertility standards for growing northern hardwoods in forest nurseries, S. A. WILDE and W. E. PATZER (*Wis. Expt. Sta.*). (*Jour. Agr. Res. [U. S.], 61 (1940), No. 3, pp. 215-221, fig. 1*).—A large number of samples of soils collected under productive stands of representative hardwood species such as yellow birch, sugar maple, basswood, American elm, and white ash were analyzed for pH value, base-exchange capacity, total and available nitrogen, available phosphorus, available potassium, and replaceable bases. The average values obtained by means of statistical treatment of the results are suggested as standards for the maintenance of fertility in hardwood nursery soils. The analysis showed that the nitrogen:phosphoric acid:potash ratio lies in the proximity of 1:2:5 for yellow birch and 1:3:5 for the rest of the hardwood species studied.

Plantation survival as related to soil type, aspect, and growing season, L. S. MINCKLER (*Jour. Forestry, 39 (1941), No. 1, pp. 26-29*).—An analysis of first year survival on 180 one-fourth acre plats distributed over a radius of about 25 miles on T. V. A. land in eastern Tennessee showed that shortleaf pine thrived best on dolomite north or south and limestone south aspects. Dense weedy growth characterized the limestone and shale north slopes, making such sites unfavorable for shortleaf pine. In a very dry year, white pine and yellow poplar gave only fair survival on limestone south slopes and failed on shale south slopes. White pine was less able to endure heavy vegetative competition than was yellow poplar. Black walnut showed relatively poor survival only on dolomite south slopes. White ash was equally good on all soils and aspects. The two direct seeded species, black walnut and northern red oak, withstood drought particularly well, due apparently to their more extensive root systems.

When all soil types and aspects were considered, ash and walnut constituted the highest survival group, yellow poplar the second, and white and shortleaf pine the third.

Vegetative propagation of conifers, C. G. DETBER (*Conn. Acad. Arts and Sci. Trans.*, 34 (1940), pp. 1-83, pls. 7).—Factors found of greatest significance in the successful asexual propagation of conifers were the season of the year at which cuttings were collected, the age of the parent tree, and the genetic variations in rooting capacity. The use of indolebutyric acid gave significant results only in the case of the hemlock. Cuttings taken from juvenile trees rooted more readily than those from older trees, and the time of taking the cuttings was less important in the case of young trees. Large scale propagation of Norway spruce from parental trees covering a wide age range appeared practicable, but in the case of white pine, propagation from trees older than 4 yr. was difficult with present technics. In hemlock, cuttings from trees 4 yr. old rooted more freely than cuttings from 20-yr. trees. Dust treatments with indolebutyric acid increased rooting in both age classes, and vitamin B₁ improved the growth of stems and roots of hemlock but not of Norway spruce cuttings.

Note on the propagation by cuttings of white pine and white spruce, J. L. FARRAR and N. H. GRACE (*Canad. Jour. Res.*, 18 (1940), No. 12, Sect. C, p. 612).—In the case of cuttings taken from 10- to 15-year-old trees and planted in outside frames protected by lath and cotton shades, the propagation medium proved to be the most important single factor affecting rooting. A mixture of peat and sand was greatly superior to sand alone, and a well-decomposed native peat of sedge origin gave better results than did European peat moss. The time of taking cuttings was important, but indoleacetic acid mixed with talc and applied to the base of cuttings had no well-marked effect on rooting. On an average, white spruce and white pine rooted 80-90 and 50-60 percent, respectively.

The effect of position within the bole upon fiber length of loblolly pine (Pinus taeda L.), J. S. BETHEL (*Jour. Forestry*, 39 (1941), No. 1, pp. 30-33, figs. 3).—Selecting three trees on a dry upland site and three on wet bottomland, the author found that the maximum fiber length occurred progressively higher up the tree with an increase in age. The height at which the maximum fiber length occurs in any particular annual ring is apparently a function of the height of the tree at the time the ring was formed. It was evident that the factor governing the length of fibers is the age of the tree at the particular level being investigated rather than the absolute age of the tree itself.

Forest resources of the Douglas-fir region, H. J. ANDREWS and R. W. COWLIN (*U. S. Dept. Agr., Misc. Pub.* 389 (1940), pp. IV+169, pls. 4, figs. 41).—A comprehensive analysis of the economic and physical aspects of the forest resources of the Douglas fir region of Oregon and Washington showed this region to include 29 million acres of forest land of which 26 million acres are classed as commercial conifer land. There is a total saw-timber stand of 546 billion board feet, all but 4 billion feet of which is conifers. Only about half the timber volume is considered economically available under current conditions. Annual depletion of the region's forests totals 8.3 billion board feet, 7.9 billion feet the result of cutting. Current annual growth amounts to 2.4 billion board feet. Under intensive forestry, a potential annual growth of 8.2 billion board feet would be possible. The region is singularly dependent upon the forest resources, more than half the population being supported directly or indirectly by forest enterprises.

Past timber cutting has been concentrated in favored localities, resulting in a shortage of raw material around many industrial centers and costly industry

migration. Conversion of the region's forests to sustained yield management is deemed imperative to the maintenance of a satisfactory regional economy.

DISEASES OF PLANTS

[Phytopathological research by the Bureau of Plant Industry] (*U. S. Dept. Agr., Bur. Plant Indus. Rpt., 1940, pp. 6, 9, 11, 15-18, 19, 20, 22, 24-26, 36-37, 38, 40*).—Brief reports of progress are presented on some of the outstanding recent accomplishments by the Bureau, including a laboratory test for the rapid detection of the two loose smuts of barley in mixtures; the control of cotton wilt through resistant varieties and potash; control of chlorosis of grapes, trees, and shrubs by iron sulfate; demonstration that clover and Sudan grass seed may carry many disease fungi, the latter, particularly, a virulent *Helminthosporium*; increases in the stands of Sudan grass and forage legumes by seed treatment; studies of sap stain fungi in lumber; prediction of decay following fires in oaks; proof that the *Ceratostomella* disease of sycamores is spread by pruning; *Fusarium* wilt of mimosa; the susceptibility of whitebark pine to blister rust; a fungus parasite (probably *Fusarium*) of dwarf mistletoe (*Arceuthobium* spp.); fusiform rust of southern pines; protection of peach seedlings from crown gall; control of bacterial blight of filberts by spraying; potato ring rot; notes on important additions to the fungus collections, the work of the Plant Disease Survey, and on a new system of composting for mushroom; chloroplerin as a promising nematocide; the spread of root knot nematodes by man; acquired immunity to curly top virus in tobacco plants; spread of chlorotic streak of sugarcane; reductions in *Aphanomyces* root rot by heavy applications of phosphate; control of diseases by crop rotations; and the use of tear gas (chloroplerin) for sterilization of tobacco seedbeds.

[Plant disease work of the Bureau of Entomology and Plant Quarantine] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt., 1940, pp. 39-50, 61-66*).—Progress reports are given on Dutch elm disease eradication; white pine blister rust control; and barberry eradication for wheat stem rust control, together with data on the incidence of stem rust in 1939, population trends in parasitic strains of the wheat stem rust fungus, and susceptibility tests, nursery inspection, and identification.

The Plant Disease Reporter, [January 15 and February 1 and 15, 1941] (*U. S. Dept. Agr., Bur. Plant Indus., Plant Disease Rptr., 25 (1941), Nos. 1, pp. 34, figs. 2; 2, pp. 35-74; 3, pp. 75-104, figs. 3*).—In addition to the host-parasite check-list revision, by F. Weiss (No. 1, *Cephalanthus* to *Cissus*, and errata for *Castanea*; No. 2, *Citrus*; and No. 3, *Cladrasia* to *Cornus*), the following items are noted:

No. 1.—The weather and disease situation in Massachusetts in 1940, by O. C. Boyd; Burley tobacco diseases in central Kentucky in 1940, by W. D. Valleau and S. Diachun; tobacco diseases in western Kentucky in 1940, by E. M. Johnson; stem rust now migrating to the South to spend the winter months, by E. S. McFadden; *Physalospora obtusa* on peach nursery stock in Arkansas, by J. C. Dunegan; rusty spot of peach, by E. C. Blodgett; studies of *Botryosphaeria ribis* on *Cercis* and *Benzoin*, by A. J. Watson; and brief notes on additional hosts and locations for the bleeding canker disease of trees, late blight in Minnesota in 1940, bacterial ring rot in Rhode Island, tobacco survey notes from Puerto Rico, and molds increase in apple orchards infested with mealybug.

No. 2.—The eelgrass situation, fall 1940, by C. Cottam; spread of white pine blister rust during the calendar year 1940; *Ceratostomella ulmi* isolated from elm wood of dish crates imported from England, by R. P. True; freezing injury to trees and nursery stock in Nebraska and Kansas during November 1940, by

E. Wright; additions to the host index of fungi of Mount Shasta, Calif., by W. B. Cooke; notes on fruit diseases (apple, peach, plum, cherry) in the Ozark section of Arkansas in 1940, by J. C. Dunegan; diseases of fruits and vegetables on the New York market during the months of April to September 1940, inclusive, by C. O. Bratley and J. S. Wiant; a case of the crown gall organism persistent in grain land, by L. C. Cochran; and a unique case of powdery mildew (*Erysiphe cichoracearum*) on lettuce in the field, by D. E. Pryor.

No. 3.—A new black raspberry disease in western Pennsylvania, by G. L. Zundel; origin of cabbage black rot epidemics, by J. C. Walker; fungus diseases of truck crops near Colma, Calif., by J. T. Middleton and M. W. Gardner; canker of red bud in New Jersey, by P. P. Pirone; field tests on the susceptibility of the southern gooseberry, *Ribes curvatum*, to *Cronartium ribicola*, H. E. Yost; brief notes on tobacco downy mildew, alfalfa, sugar beet, and tomato diseases observed in Mexico, *Pythium* foot rot of small grains reported in Virginia, and *Vermicularia trichella* on *Hedera helix* in an Oregon greenhouse; and a hardiness map for the United States.

[Studies in disease control] (U. S. Dept. Agr., Sec. Agr. Rpt., 1940, pp. 150-151).—A brief note on potash as an aid to control of cotton wilt and of phosphate applications for a serious root disease of sugar beet.

Plant pathology notes, G. E. THOMPSON and J. H. MILLER (Ga. Univ. Bul., 39 (1939), No. 8, p. 35).—Brief notes on tomato seed tests, cottonseed tests for disease organisms, and plant disease survey for Georgia.

[Phytopathological findings by the New Jersey Stations] (New Jersey Stat. Rpt. 1940, pp. 48, 51, 52, 54, 59, 60-61, 61-62, 72, 74-75).—Brief reports are given on the best fungicides and schedules to use for the Brooks fruit spot control; adhesiveness of copper fungicides in relation to safety; the present status of the "X" disease and *Valsa* canker of peach in New Jersey; the most effective fungicides for controlling cherry leaf spot; sanitary measures in control of spur blight of raspberry; sweetpotato pox control through pH adjustment of the soil by sulfur; control of wilt in eggplants by rotations, soil management, and similar methods; recent advances in chemical control of root knot on vegetable crops; the best bordeaux formulas for potatoes in central New Jersey; and safeguarding the street and shade trees of the State against old and new diseases, such, e. g., as the *Phytophthora* disease of Norway maple and the chlorosis of pin oak.

Plant pathology. (Partly coop. U. S. D. A.). ([New York] Cornell Sta. Rpt. 1940, pp. 144, 145, 146-153).—Brief progress reports on the following work by various members of the station staff (C. H. Myers, R. A. Emerson, H. M. Munger, F. M. Blodgett, P. Decker, E. D. Hansing, S. G. Younkin, W. H. Burkholder, A. B. Burrell, F. H. Lewis, L. A. Brinkerhoff, C. Chupp, A. W. Dimock, F. A. Haasis, C. E. Williamson, L. M. Massey, K. Longrée, W. D. McClellan, A. G. Newhall, D. Reddick, W. R. Mills, D. S. Welch, K. G. Parker, and L. J. Tyler) are included: Breeding cucumbers and muskmelons for disease resistance; potato seedling tests for scab resistance; potato rotations for disease control; potato yellow dwarf; bacterial diseases of gardenia, carnation, onion, tomato, and pepper; boron deficiency of apple; field fungicidal tests for apple scab control; monograph of the genus *Cercospora*; control of club root of crucifers; control of diseases of miscellaneous ornamentals under glass; *Verticillium* disease of chrysanthemums and other greenhouse ornamentals; diseases of narcissus and tulips; rose diseases; damping-off of ornamental seedlings and its control; permanent crop improvement by disease control through development of immune or resistant stocks; Dutch elm disease studies; bulb nematode of onions; celery root and storage rots; and control of onion smut and mildew.

Plant disease studies (*Oklahoma Sta. Bien. Rpt. 1939-40, pp. 128-138, figs. 8*).—Brief reports are given on the progress of investigations involving a new machine for treating seed to control loose smut of cereal crops; resistant varieties as the only means of controlling leaf rust of wheat; the cost of cottonseed treatment found more than repaid by higher yields; studies of seedling disease in cotton as an aid to better stands; cotton wilt checked by introduction of resistant varieties; the virus mosaics of cowpea and their control; "charcoal rot" of sorghum, corn, and other crops (coop. U. S. D. A.); and sorghum root and stalk rots.

[Phytopathological studies by the Texas Station] (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1939, pp. 16, 79-80, 84-95, 149-151, 169-170, 170-177, 186, 187, 205, 224, 225, 226, 250, 254, 256, 258-259, 262-263, 263-264, 275-276, 282-284*).—Progress reports by various station workers (E. S. McFadden, P. C. Mangelsdorf, J. J. Taubenhaus, W. N. Ezekiel, H. E. Rea, S. H. Wender, L. M. Blank, P. J. Talley, G. A. Greathouse, N. E. Rigler, G. E. Altstatt, D. T. Killough, J. E. Roberts, A. A. Dunlap, A. L. Harrison, S. S. Ivanoff, G. H. Godfrey, H. Rich, E. W. Lyle, A. L. Martin, C. E. Minarik, C. H. McDowell, C. H. Rogers, T. B. Randolph, P. A. Young, and L. E. Brooks) are included on breeding wheat and oats for resistance to rusts; various investigations on *Phymatotrichum omnivorum* root rot, including sclerotial longevity, spore stage, variations, resistance of cotton, girdling and topping of cotton plants as influencing survival of the fungus, age of cotton plants as affecting susceptibility to field inoculation, greenhouse and field studies on root rot and its control, causes of immunity and resistance, growth response of the fungus to certain inorganic nitrogen compounds, zinc, and sulfur, effects of continuous grass, rotations, and clean fallow on the fungus, residual effects of oil and ash treatment on cotton, crude oil treatments, including effects of depth of application on cottonseed germination, root rot fungus, and cotton yield, effects of soil treatments on root rot of various plants, cottonseed treatments, germination of cottonseed from plants killed by root rot at different dates, fertilizer-rotation test on cotton yield and root rot infestation, yields and resistance of cowpea varieties to root rot, resistance of grape rootstocks to root rot, and sorghum as a root rot remover; cotton varieties resistant to root rot; regional studies of *Fusarium* wilt of cotton; water economy of cotton in relation to excessive shedding of squares and immature bolls; tomato diseases, including injuries from soil drenches, spray-material tests, factors affecting inoculations of tomatoes with *F. lycopersici*, varietal resistance to *Fusarium* wilt (including breeding), perfect stage of *Sclerotium rolfsii*, dodder (*Ouscuta indecora*) attacking tomatoes in coldframes, chloropicrin to control soil pathogens, damping-off control, dusting tests for early blight, and fruit pox etiology; selection and disinfection of garlic cloves for planting; control of crapemyrtle mildew; fungicides for rose black spot, isolation of roses to avoid black spot, and artificial inoculations with conidia of the fungus; crown gall control on rose cuttings; sulfur dioxide for defoliation of roses; varietal resistance of watermelon to *Fusarium* wilt; physiology and diseases of rice, including the effects of magnesium and calcium on "white tip," rice straighthead, black kernel disease due to *Oryzularia lunata*, fungi recovered from the dust of strawstacks, and the effects of fertilizers and seed treatments on black kernels and yield; important diseases of miscellaneous plants in 1939; charcoal disease (*S. bataticola*) of sorghum; citrus diseases and their control, including chlorosis and *Diplodia* stem-end rot of lemons; cabbage seed treatments for black rot; spray tests for potato early and late blights; potato scab control by band applications of sulfur; flax pasmo (*Phlyctaena unicola*); resistance of Sudan grass to rust, *Helminthosporium* blight, and bacterial stripe; chrysanthemum

root failure due to meadow nematode; chlorosis of roses and other plants; effects of various soil fumigants on seed germination of snap beans and teosinte; virus-induced eggplant yellows and its insect transmission; cantaloup breeding for downy mildew resistance; control of downy mildews of cantaloup and spinach by dusting; and breeding onions for pink root resistance.

[Plant disease work by the Utah Station] (*Utah Sta. Bul.* 294 (1940), pp. 10, 11, 12, 31, 32, 39, 40, 51-57, 61, 68-71, 72, figs. 10).—Brief reports of progress are included on physiological experiments; development and testing of tomatoes for resistance to curly top; selection and propagation of alfalfa strains resistant to bacterial wilt; the relations of *Pseudomonas* (= *Phytophthora*) *medicaginis* and *Ascochyta* sp. to alfalfa stem blight; soil-borne diseases of potato, including bacterial ring rot; tomato diseases in Utah, including wilt diseases, bacterial canker, curly top, and mosaic; survey for western celery mosaic; heartburn v. boron deficiency in celery; chlorosis and related mineral deficiency diseases of horticultural crops in Utah, including grape chlorosis and little leaf of sweet cherries; and viruslike diseases of stone fruits, including cherry leaf mottle and lace leaf, leaf spot of Italian Prune plums, and "X" disease of peach and chokecherry.

Plant diseases (*West Virginia Sta. Bul.* 298, pp. 26, 26-27).—Brief notes are presented on progress with studies of orchard fruit and leaf injuries from spraying, by C. F. Taylor; a rust-resistant red cedar, by A. Berg; and insect transmission of potato bluestem, by J. G. Leach and J. R. Mullin.

Nineteenth annual report of the Canadian Plant Disease Survey, 1939, I. L. CONNERS (*Canada Dept. Agr., Sci. Serv., Plant Disease Survey Ann. Rpt.*, 19 (1939), pp. [1]+XI+112).—This report follows the same general procedure as previous ones of the series (*E. S. R.*, 81, p. 796).

Some data concerning the history of phytopathology in Brazil and the first notices of diseases of plants in the country, A. PUTTEMANS, trans. by A. E. JENKINS and A. D. MARCHANT. (Coop. U. S. D. A.). (*Jour. Agr. Univ. Puerto Rico [Univ. Sta.]*, 24 (1940), No. 3, pp. [3]+77-107, pls. 9).—As stated in the foreword, by Jenkins, "the history of the development of phytopathology in Brazil, covering nearly three quarters of a century, forms a valuable contribution to the subject in general, containing as it does much information of international interest not otherwise available. A pioneer phytopathologist in Brazil, Dr. Arsène Puttemans was uniquely qualified by reason of his 40 yr. of service there to present at the 'Primeira Reunião de Phytopathologistas do Brasil' this account of the growth of the science in that country." Addenda present notes and a bibliography of 104 entries.

On the systematics of gram negative bacterial plant pathogens, W. J. DOWSON (*Chron. Bot.*, 6 (1941), No. 9, pp. 198-199).—A further discussion and clarification of the subject previously noted (*E. S. R.*, 81, p. 796).

Quantitative comparison of methods for sterilizing solutions of organic compounds used in culture media, G. A. GREATHOUSE and N. E. RIGLER. (Tex. Expt. Sta. coop. U. S. D. A.). (*Phytopathology*, 31 (1941), No. 2, pp. 149-158).—The losses from a number of typical organic compounds at 0.01 M concentration were compared by (1) autoclaving in presence of water, medium No. 70, and Czapek's solution, (2) intermittent steaming in presence of water, and (3) alcohol. With the series of fatty acids the losses from heat treatment increased progressively from formic to pelargonic and thereafter decreased. For acids with less than 10 O atoms the losses were greater in the salt-solution media than in water, but for most of the other compounds tested the differences were slight. The more water-soluble and strongly polar compounds (alcohols, phenols, acids, amides, and amines) were vaporized to a smaller extent than the more volatile, less soluble, and less strongly polar compounds.

(esters, ethers, aldehydes, and hydrocarbons). Of the 33 compounds tested, only formic, acetic, and propionic acids suffered greater losses by sterilization with the original alcohol evaporation technic than by heat treatment. Recommendations are given for sterilizing organic compounds for culture studies without loss and minimum alteration. The data indicate that when a great degree of accuracy is required the contemplated sterilization method should be tested to determine whether it is applicable to the types of compounds under consideration.

Survival of fungi in the digestive tract of cattle, B. STIEMENS (*So. African Jour. Sci.*, 36 (1939), pp. 220-224).—The importance of the possible survival of spores of *Diplodia* *seae* and *Gibberella saubinetii* after passage through the digestive tract of cattle in the spreading of the disease to the maize crop led to the work here reported. *Diplodia* spores were not found viable after such passage, they did not germinate on fresh manure, nor could *Gibberella* spores be recovered from the feces.

A new Ascochyella on Pentstemon from California, A. E. JENKINS. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 2, pp. 194-197, fig. 1).—*A. pentstemonii* n. sp. is described on wild *P. spectabilis* from San Antonio Canyon, near Claremont, Calif., where the fungus was collected (1939) by C. L. Shear and H. C. Fawcett. The fungus, which was isolated, occurred both on small raised stem cankers and on larger cankered areas reaching 10 cm. in length.

Supplement to "The species of Cintractia in the flora of Argentina" [trans. title], E. HIRSCHHOFF (*Rev. Argentina Agron.*, 7 (1940), No. 2, pp. 128-132, pls. 2, figs. 2).—Additional species of this rust genus from Argentina.⁵

Gymnosporangium rusts in Maine and their host relationships, A. E. PRINCE and F. H. STEINMETZ (*Maine Univ. Studies*, 2. ser., No. 50 (1940), pp. 111-146, fig. 1).

Factors influencing the carbon metabolism of the crown gall organism, F. C. MCINTIRE, W. H. PETERSON, and A. J. RIKER. (Wis. Expt. Sta. et al.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 4, pp. 313-319).—Under conditions whereby *Phytoplasma tumefaciens* was grown rapidly in a synthetic medium with only small variation in the products from carbon metabolism, the growth rate and sugar fermentation were considerably increased by aeration and the fermentation was further stimulated by adding plant extracts. The size of inoculum, amount of aeration, and, where cultures were aerated with a stream of air, the amount of sugar in the medium influenced the amount of sugar fermented. The uniformity among replicate cultures with respect to sugar fermented and to distribution of metabolic products was influenced by the size of inoculum, fermentation time, and type of aeration, the last seeming to be the most important. Consistently reproducible fermentations were obtained in cultures receiving a 5 percent inoculum of 24-hr. liquid culture and aerated by shaking. The ratio of metabolic products was related to the concentration of unfermented sugar in the medium. When its concentration was high the ratio of CO₂ to unidentified products was low, and vice versa. This ratio increased with age of culture.

Germination experiments with uredio- and teliospores of *Tranzschelia pruni-spinosae* discolor, J. C. DUNEGAN and C. O. SMITH. (U. S. D. A. and Ark. and Calif. Citrus Expt. Stas.). (*Phytopathology*, 31 (1941), No. 2, pp. 189-191, fig. 1).—Urediospores were sown on water agar and incubated for 3 hr. at various temperatures, vigorous germ-tube growth being obtained at 10°-25° C., but little germination at 30°, and none at 35.5°. With leaves of cultivated *Prunus* species bearing uredia and kept outdoors on the ground and in cheese-

⁵ *Rev. Argentina Agron.*, 6 (1939), No. 3, pp. 179-202, pls. 4, figs. 2.

cloth packets, indoors at room temperature, and in a refrigerator at 5°, the effects were variable, but urediospores from leaves held at 5° were still viable after 537 days. Overwintered teliospores from *P. (=Amygdalus) communis* leaves were germinated on water agar. The promycelium may develop from either cell of the spore, emerging near the septum between the two cells. The basidiospores were almost globose in shape, measuring 8-8.5 μ by 6-6.5 μ .

Descriptions of tropical rusts, III, G. B. CUMMINS. (Ind. Expt. Sta.). (*Bul. Torrey Bot. Club*, 67 (1940), No. 7, pp. 607-613, figs. 2).—In this paper of the series (E. S. R., v. 3, p. 204), aside from the nine new species described some other collections of unusual interest are cited.

Longevity of teliospores of Puccinia graminis under laboratory conditions, T. JOHNSON (*Phytopathology*, 31 (1941), No. 2, pp. 197-198).—Teliospores germinated and infected barberry after continuous freezing up to 21 yr., and those previously rendered germinable were found to retain their viability and infectivity in dry storage at 8°-10° C. for over 6 yr.

Effect of X-radiation on the germination of chlamydospores of Ustilago hordei, H. A. RODENHISER and L. R. MAXWELL. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 2, pp. 175-181, figs. 2).—Studying the effect of X-rays on chlamydospore germination, promycelial and sporidial development, and sectoring, it was found that chlamydospore germination was not materially affected by dosages up to 100 kr. (kiloroentgen). At higher dosages the number of nonviable spores and the germination time of the viable ones increased in varying amounts with increasing dosages up to 1,000 kr., at which point all the spores were killed. There was some evidence that the degree of X-ray sensitivity depends on some unknown physiological condition of the chlamydospore. Irradiation of chlamydospores at certain dosages resulted in elongation of the promycelium. It was noticeable at 30 kr. and became progressively more marked at 60, 100, and 150 kr. For the last dosage, promycelial lengths were approximately three times the normal. The normal number of sporidia was formed on promycelia from chlamydospores irradiated up to 60 kr., on only about 10 percent of the promycelia at 100 kr., and above this point only occasionally. X-irradiation of chlamydospores at 50 and 100 kr. did not affect the rate of mutation in cultures of monosporidial lines.

A new cause of foot disease in wheat, barley, rye, and oats (Colletotrichum graminicolum (Ces.) Wilson?) [trans. title], A. G. WINTER (*Phytopathol. Ztschr.*, 13 (1940), No. 3, pp. 282-292, figs. 9).—The author describes a mycosis of the roots, culms, and leaf sheaths of these cereals. A definite determination of the fungus was impossible, due to lack of fructifications, but it appears to be identical to the *C. graminicolum* reported from Canada as causing a similar disease of oats.

Two additional factors for resistance to mildew in barley, E. H. STANFORD and F. N. BIGGS. (Calif. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 3, pp. 231-236).—The authors report two new genetic factors for resistance to race 3 of powdery mildew (*Erysiphe graminis hordei*). The Psaknon (*Ml₂*) factor, in the Psaknon variety, is dominant in effect and identical to one of the two factors previously reported in Arlington Awnless, Nigrata, and Chinermé. Hereafter *Ml₂* will replace the *Ml₁* factor designation tentatively assigned to these varieties. A new factor found in Duplex combined with two previously identified factors, *Ml₁* and *Ml₂*, is recessive in effect and designated as the Duplex (*ml₃*) factor. The full factorial composition is given. In all there are seven factors for resistance—six dominant and one recessive—and the number in a single variety varies from one to three. Of the seven identified, two are definitely linked.

Modification of diurnal transpiration in wheat by infections of *Puccinia triticina*. C. O. JOHNSTON and E. C. MILLER. (U. S. D. A. coop. Kans. Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 6, pp. 427-444, figs. 5).—The effects of leaf rust on the transpiration of a resistant and a susceptible variety of spring wheat grown to maturity in sealed stone jars was studied in the greenhouse during 3 yr., plants in the flowering stage proving superior to younger plants or seedlings for this work. Normal transpiration rose very rapidly during the morning, reached a maximum about noon, and declined rapidly in late afternoon, remaining extremely low during darkness. Observations at 2-hr. intervals for 48-hr. periods (1935-36) indicated that rusted plants of the susceptible variety transpired 13.17 percent and 32.7 percent, respectively, more than nonrusted controls for the entire 2-yr. period. The diurnal rhythm of transpiration was seriously disturbed in rusted plants of the susceptible variety, such plants transpiring much more than controls during the night. In 1935 the increase in nocturnal transpiration of rusted plants over the controls was 83.41 percent, while in 1936 it was 89.62. The higher transpiration rate of rusted plants at night was apparently due in part to transpiration through ruptures in the cuticle caused by the uredia and partly to the transpiration of the fungus itself.

The use of chlorine gas as a seed disinfectant. R. W. LEUKEL and O. A. NELSON (U. S. Dept. Agr. Cir. 576 (1940), pp. 16, fig. 1).—As tested in field and laboratory, surface-borne spores of certain cereal smuts were not all killed by 5-min. exposure to undiluted chlorine gas, but under certain conditions 2-hr. exposure to 1 percent gas by volume inhibited spore germination without seed injury. Spores carried beneath the glumes were not killed. To kill surface-borne smut spores without seed injury, the Cl concentration should be 3-9 percent by volume, the period of exposure 1-2 hr., and the volume of gas not less than 20 percent or greater than 40 percent of the net volume of seed. A considerable percentage of adult grain weevils survived exposure to 10 percent gas for 1 hr. and to 50 percent for 10 min. Using the commercial outfit employing chlorine gas for custom seed treatment, tests indicated that the seed was being exposed to a concentration of less than 0.5 percent Cl gas for about 3 min. When smutty seed of wheat, oats, and barley, treated once and twice in this outfit, was sown in field plats along with untreated seed, emergence was in no case improved, nor was satisfactory smut control obtained.

Soil mold, *Phytophthora capsici*, attacks important truck crop plants of Colorado. W. A. KREUTZER and E. W. BODINE (*Colo. Farm Bul.* [Colorado Sta.], 3 (1941), No. 1, pp. 3-5, fig. 1).—This pathogen is believed to infest most of the arable soil in the Arkansas River Valley, where pepper blight, tomato rot, and diseases of other truck crops due to this fungus are becoming a serious menace. Discussions of the factors favoring infection, the existence of strains of the pathogen, and recommended control measures are briefly presented.

Fungi associated with diseases of cotton seedlings and bolls, with special consideration of *Glomerella gossypii*. R. WEINDLING, P. R. MILLER, and A. J. ULLSTROP. (U. S. D. A. and S. C. Expt. Sta.). (*Phytopathology*, 31 (1941), No. 2, pp. 153-167, figs. 3).—Random samples of diseased specimens were secured from most sections of the Cotton Belt (1938-39). *G. gossypii* was widely distributed on bolls and was predominant in cultures from seedlings. *Rhizoctonia solani* was widely spread but occurred on few seedlings. *Fusarium moniliforme*, other *Fusaria*, and *Alternaria* spp. were frequent on seedlings and bolls. Most boll spots harboring *G. gossypii* were indistinguishable from those yielding other fungi. This change in type from symptoms described in the early literature is attributed to unfavorable conditions for boll rot due to the adop-

tion of early maturing cotton varieties of open type. Mixing of seed with infested trash during ginning will spread the fungus on seed sufficiently to cause damping-off. This may explain the abundance of *G. gossypii* on seedlings in spite of its infrequency on bolls. The scarcity of *G. gossypii* in Texas and Oklahoma seems attributable to dry conditions which check summer survival on dead tissues of cotton stems and leaves.

Wilt resistance of the new cottons, D. C. NEAL and H. B. BROWN. (La. Expt. Sta.). (*Better Crops With Plant Food*, 24 (1940), No. 10, pp. 16, 46, fig. 1).—During 1939, eight new strains and three F₁ hybrid lines were studied for *Fusarium* wilt resistance on uniformly infested soil, along with the extremely susceptible Half and Half. Six proved outstanding in resistance, the infection ranging from 0.4 percent for the best one (Delfos) to 87 percent for the susceptible control. Seed stocks of some of these strains have been increased and are available for planting in wilt-infested districts.

The infection capabilities of hop downy mildew, G. R. HOERNER. (U. S. D. A. coop. Oreg. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 5, pp. 331-334, fig. 1).—The host range of *Pseudoperonospora humuli* was considerably extended by this study, but all hosts were members of the nettle family. Of the hop species inoculated, *Humulus japonicus* and *H. japonicus variegatus* showed some resistance, but evidence of resistance in horticultural varieties or strains of hops developed by selection or hybridization was inconclusive. In view of the successful inoculation of *P. humuli* into species of *Cannabis*, *Celtis*, and *Urtica*, hosts, respectively, of *P. cannabina*, *P. celtidis*, and *P. urticae*, it is suggested that the forms of *Pseudoperonospora* described under these names, along with *P. humuli*, may eventually prove to be physiological races of one species.

Eye spot of lemon grass, B. A. BOURNE (*Phytopathology*, 31 (1941), No. 2, pp. 186-189, fig. 1).—The author describes the disease fully and establishes its etiology. By cross-inoculation and other studies it was demonstrated that this disease of both lemon grass and sugarcane is caused by *Helminthosporium ocellum* (*H. sacchari*).

The shape and development of potato tubers and their significance in the diagnosis of spindle tuber, J. G. BALD, B. T. DIXSON, and D. O. NORRIS (*Phytopathology*, 31 (1941), No. 2, pp. 181-186, fig. 1).—Three stages were recognized in the development of tubers from normal potato plants of the Factor (Up-to-Date) variety and from plants with a disease diagnosed in Australia as spindle tuber. These stages comprise a radial swelling of the stolon to form a tuber rudiment, swelling of this rudiment without change of shape, and elongation at a greater rate than radial expansion. The shape of normal and diseased tubers in the second stage is similar. The greater elongation of the mature tubers (third stage) from diseased plants depends on the earlier initiation of that stage.

Soybean mosaic and its insect transmission [trans. title], K. HEINZE and E. KÖHLER (*Phytopathol. Ztschr.*, 15 (1940), No. 3, pp. 207-242, figs. 16).—The symptoms are described, including a strongly necrotic variant. Using carborundum powder and juices from infected plants, 100 percent infection was obtained. By the rubbing method the disease was transferred from soybean to common bean and common vetch (*Vicia sativa*), but not to garden pea, hairy vetch (*V. villosa*), or *Pisum arvense*. The following aphids were found capable of transmitting the virus: *Doralis frangulae*, *D. rhamni*, *D. fabae*, *Macrostiphum solanifolii*, *Aulacorthum pseudosolani*, *Myzus ornatus*, *Myzodes persicae*, and *Neomyzus circumflexus*. No incubation period in the vector was necessary.

Development of secondary tumors and tumor strands in the crown gall of sunflowers, A. C. BRAUN (*Phytopathology*, 31 (1941), No. 2, pp. 135-149,

figs. 7).—This study indicated that secondary tumors and tumor strands can be produced by introducing the *Phytophthora tumefaciens* at a distance of 4-6 in. from the apical bud into internodes that had elongated to, or almost to, their full length, thus proving that these structures are truly secondary and do not depend for their development on the rapid elongation of immature tissue. The ridgelike overgrowths, which sometimes extend from the primary tumor to within a short distance of the soil line, are also secondary. Tumor strands and secondary tumors occurred invariably in association with the xylem region of sunflower plants. The strands are not direct outgrowths of the primary tumor, as suggested by E. F. Smith, but develop laterally from the xylem region into the pith. Two distinct types of secondary tumors are described, differing both from the standpoint of their relative positions on the host and in their internal structure. Secondary tumors and tumor strands may be produced by an attenuated strain of *P. tumefaciens* even though no primary tumor be formed. This suggests that the pathogenesis of these secondary structures may not be identical with that in the primary tumor.

The bronzed disease of the tomato [trans. title], L. BONNEMAISON (*Ann. Épiphyt. et Phytoéc. n. scr.*, 5 (1939), No. 3, pp. 267-308, figs. 22).—This is a monographic study of the virus disease usually known under the name of tomato spotted wilt. It comprises the history and geographical distribution of the disease (over three pages of references); the virus and its properties; the vector (*Thrips tabaci*), including studies of its general morphology, the buccal apparatus, mode of nutrition, biology, and the behavior of the virus within the vector; the host symptoms, factors influencing them, and overwintering of the virus; the techniques used in preparing the virus, mechanical inoculations, and rearing the vector; an account of the successful inoculations by mechanical means and by the vector; and suggested methods of control by destroying the thrips, suppression of the plant host, and obtaining resistant viruses.

The refractory diffusion method of Lamm and a modified Ostwald viscometer, as used in a study of the tobacco mosaic virus protein, V. L. FRAMPTON. (Cornell Univ.). (*Phytopathol. Ztschr.*, 13 (1940), No. 3, pp. 272-281, figs. 10).—The refractory method of Lamm, carrying out diffusion studies, and a viscosimetry method are discussed. Anomalies in the diffusion and viscosity of this virus protein are pointed out, and data obtained with it are compared with those using glycerine. An indication of the rate of sol-gel transformation in the virus protein-water system is obtained from observing a sphere falling through a sol under polarized light.

Morphological and anatomical features of phylloidy in varieties of tomatoes and beans, B. F. DANA. (Oreg. Expt. Sta. coop. U. S. D. A.) (*Phytopathology*, 31 (1941), No. 2, pp. 168-175, figs. 4).—"In phylloid tomato blossoms carpels often were represented by simple leaflets adhering by their margins or fully separated. In bean transformations, the phylloid ovary varied from an inflated, saclike structure, through a marginal-veined leaf with marginal leaflets representing the ovules, to normal-appearing leaves. There was an extension of the axis between whorls of the phylloid flower where there was not a close relationship (adhesion or union) of vascular traces supplying these adjacent whorls. In common bean there were found secondary or accessory phylloid flowers, inflorescences with phylloid flowers, and shoots produced by axis extension beyond the carpel of the primary flower. Vegetative modifications of the perianth occurred in both tomato and beans. In extreme cases, members of the perianth whorls were represented by leaflike structures. Stamens failed to mature normally but persisted, and were separate in the phylloid tomato blossom."

Pathogenic and cultural variation among single-spore isolates from strains of the tomato-wilt *Fusarium*, F. L. WELLMAN and D. J. BLAISDELL. (U. S. D. A.). (*Phytopathology*, 31 (1941), No. 2, pp. 103-120, figs. 2).—Studies of more than 2,000 single-spore isolates from 18 parent strains of *F. bulbigenum lycopersici* indicated that the tendency to variation is from cultures with abundant aerial mycelium (highly pathogenic) through intermediate types to cultures of appressed slimy character with little or no aerial growth (very mildly pathogenic), and the cultural type obtained was independent of choice of macrospores, microspores, or chlamydospores. Of the total isolates, 3 varied towards a more raised growth type. The complete range of cultural variants was secured only from strains of the unstable yet fully raised types of culture. By selection from successive generations of single-spore reisolations out of sectors, strains with little or no aerial mycelium (low pathogenicity) were obtained from parent cultures that originally had developed abundant mycelium in culture (highly pathogenic).

Chemical investigations relating to magnesium deficiency of fruit trees. T. WALLACE (*Jour. Pomol. and Hort. Sci.*, 18 (1940), No. 2, pp. 145-160, pl. 1).—Data from soil and foliage samples (apple, black currant, gooseberry, and plum) from 10 centers where symptoms of magnesium deficiency had occurred showed a low Mg content in the leaves and it was indicated that when either CaO or K₂O dominated the other was deficient. At one center the MgO in the leaves did not vary appreciably under wide levels of K₂O. Two groups of MgO deficiency were distinguished, viz, with CaO also low and with this base high. A time lag may be expected after applying lime and MgSO₄ before the levels of CaO and MgO become satisfactory in the apple foliage. The possible importance of Mg deficiency in abnormal susceptibility to spray injury is discussed.

Magnesium deficiency of apples in the Nelson district of New Zealand, H. B. KIDSON, H. O. ASKEW, and E. CHITTENDEN (*Jour. Pomol. and Hort. Sci.*, 18 (1940), No. 2, pp. 119-134, pls. 2, fig. 1).—Premature defoliation of apple trees in this region was identified as a magnesium deficiency, and injection of MgSO₄ into the branches prevented the leaf blotching and defoliation. A large number of analyses indicated a close correlation between leaf blotching and a low Mg and high K content in the leaves, and premature defoliation was found most severe under liberal potassic fertilization. It is believed that the unfavorable ratio between these two elements in the soil has reduced the Mg intake by the trees.

Bitter pit of apple.—I. In orchard and in storage, M. B. CUMMINGS and R. G. DUNNING (*Vermont Sta. Bul.* 467 (1940), pp. 30, pls. 4).—This bulletin sets forth the history of this functional disease of most apple regions where susceptible varieties are grown, presents data secured in the station orchard, and discusses its development in storage at different temperatures. Of the 40 varieties under observation, only Arctic, Baldwin, Northern Spy, and Shiswassee have proved susceptible. The disease is very erratic, occurring all over a tree, on any quadrant, high up or low down, in shade or sun, on a tree's periphery or its interior. It may be ripe one year and absent the next, and all over one tree when its neighbor is free. Furthermore, an apparently normal crop may be harvested only to go bad in storage, where it develops usually during the first 2-3 mo. It is stated that if pit develops at harvest or in storage the apples may be sorted and sold at midwinter with assurances that little or no more will be seen, since all pits appear a few weeks before decay sets in.

Boron in relation to bitter pit in apples, T. WALLACE and J. O. JONES (*Jour. Pomol. and Hort. Sci.*, 18 (1940), No. 2, pp. 161-176).—In storage tests

(1935-36) on fruits and chemical studies on fruits and leaves it was shown that the pitting troubles were not concerned with boron. The major ash constituents (Ca, Mg, K, and P) were present in normal amounts in both fruits and leaves, and the status of Ca in these was not affected by boric acid injections.

The red core root disease of the strawberry caused by *Phytophthora fragariae* n. sp., C. J. HICKMAN (*Jour. Pomol. and Hort. Sci.*, 18 (1940), No. 2, pp. 89-118, pls. 2, figs. 4).—An account is given of the first authenticated outbreaks of this disease in England, and it is stated that a similar if not identical disease has recently been recognized in the United States. The symptoms and studies of the fungus are described. The roots become invaded at the tips, the fungus passing backwards in the central vascular cylinder and occasionally reaching the rootstock. High soil moisture favors development of the disease, and it appears to be inhibited by soil alkalinity. Some varieties proved resistant, and four new seedlings are said to be immune. The disease is undoubtedly spread from one locality to another by infected runners, and it is said to be the most menacing one attacking strawberries. There are 27 references.

The use of wraps containing o-phenylphenol for citrus fruits, J. E. VAN DER PLANK, J. M. RATTBAY, and G. F. VAN WYK (*Jour. Pomol. and Hort. Sci.*, 18 (1940), No. 2, pp. 135-144).—These wraps significantly reduced fruit infection by *Penicillium digitatum*, *P. italicum*, and *Trichoderma lignorum* in standard commercial packs, but tended strongly to injure the rind when too much of the preservative was used. Lemons were less readily injured than oranges. When glyceride oils were added to these wraps, more of the preservative could be used without causing injury and the oil did not significantly affect its potency.

Investigations of mal secco or "kurutan" of lemon trees [trans. title], G. GASSNER (*Phytopathol. Ztschr.*, 13 (1940), No. 1, pp. 1-90, figs. 50).—This is a review (52 references) and monographic study of the destructive disease due to *Deuterophoma tracheiphila*.

Root rot of orange trees [trans. title], J. P. DA COSTA NERO (*Rev. Agron. [Brazil]*, 4 (1940), No. 44, pp. 643-646, figs. 4).—A note on the disease due to *Deuterophoma tracheiphila*, usually known as mal secco, which occurs in southern Brazil and neighboring regions of Argentina.

The scab (*Elsinoë australis*) of sweet orange in Uruguay [trans. title], J. C. BERTELLI (*Rev. Assoc. Ingen. Agrón. [Montevideo]*, 12 (1940), No. 4, pp. 17-20+[1], figs. 29; *Eng. abs.*, p. [1]).—The author describes the symptoms of this disease at different stages, as observed in the citrus zone of northern Uruguay, and the technic used in microscopical preparation and staining of the fungus, and outlines recommended control measures. In spring conidial infection was found to occur through the cuticle or via the stomata. It was also noted that wounds may become infected by conidia through the agency of thrips.

Necrosis of the coffee tree [trans. title], V. WELLBORN (*Café el Salvador*, 10 (1940), No. 115, pp. 484-500).—The author discusses the gross and microscopic symptoms, cause, affinities, and control of the coffee tree phloem necrosis in Liberia and Surinam, recent studies of the disease in Surinam, and the present status of investigations on insect transmission.

Further evidence for multiplication of the aster-yellows virus in the aster leaf hopper, L. M. BLACK (*Phytopathology*, 31 (1941), No. 2, pp. 120-135).—The aster yellows virus (*Chlorogenus callistephi vulgaris*) was mechanically transmitted from insect (*Macrostelus diviseus*) to insect. Juice from viruliferous insects was infectious at dilutions as high as 1:1,000 in 0.85 percent NaCl solution. The virus in insects inoculated mechanically underwent a minimum incubation period of 11-45 days. Once these insects began to transmit the virus, they usually did so throughout life. Mechanical transmission proved

more efficient at 0° C. than at 25°. Most of the virus was inactivated by freezing viruliferous insects for 20 min. at -10°, and by 24 hours' storage at 0° of insect juice diluted 10⁻⁵ with 0.85 percent NaCl solution. Direct experimental evidence indicated that the virus multiplied at least one-hundred-fold during the first 12 days of a 17-day incubation period, and it reached a high concentration in the insects 6 days before the end of the incubation period.

A study of chlorosis affecting the Japanese azalea, T. H. McHATTON and R. A. BOWDEN (*Ga. Univ. Bul.*, 39 (1939), No. 8, pp. 36-39, figs. 2).—In the tests reported, iron sulfate sprayed or applied to the soil partially controlled the chlorosis, the response being more rapid in an acid than in a neutral soil.

Bacterial wilt of carnation, L. K. JONES. (Wash. State Col.). (*Phytopathology*, 31 (1941), No. 2, p. 199).—Wilting and death of carnation plants due to an undescribed bacterial species is reported.

Bacterial leaf spot of gardenia, W. H. BURKHOLDER and P. P. PIRONE. (Cornell Univ. and N. J. Expt. Stas.). (*Phytopathology*, 31 (1941), No. 2, pp. 192-194, fig. 1).—In the fall of 1938, a severe spotting of gardenia foliage was observed in a greenhouse at New Brunswick, N. J., the Belmont, Hadley, Pierson, and Veitchii varieties and the botanical species *Gardenia radicans* being infected. The cause was proved to be *Phytomonas gardeniae* n. sp.

Effect of magnesium on Primulas, R. A. BOWDEN (*Ga. Univ. Bul.*, 39 (1939), No. 8, pp. 33-35, figs. 2).—A chlorotic condition in two species of primrose, resulting in dwarfing of the leaves, failure to bloom, and gradual and continuous loss of plants throughout the summer, responded to addition of Mg to the soil.

Fertilizer in relation to disease in roses, H. R. ROSEN. (Ark. Expt. Sta.). (*Better Crops With Plant Food*, 24 (1940), No. 10, pp. 21, 22, 43, 44, fig. 1).—In 4 years' field tests no correlation was found between fertilizers or their absence and the amount of black spot, but there was a very obvious correlation of late spring frost injury and dieback with the fertilizers and mulches. As a whole, the experiments indicated that barnyard manure, peat moss, and presumably other organic materials as mulches are very unsafe for roses, predisposing them to frost injury. The possible value of soluble potash in this connection is noted.

Some outstanding needs for research in tree husbandry—pathology, D. S. WELCH. (Cornell Univ.). (*Natl. Shade Tree Conf. Proc.*, 15 (1939), pp. 77-81).—An address.

Diseases of trees: Latest findings on various infections of trade importance reported in recent research studies, L. R. TEHON (*Amer. Nurseryman*, 72 (1940), Nos. 3, p. 28; 4, p. 28; 5, p. 26; 6, pp. 22, 23; 7, p. 28; 8, pp. 24-26; 9, pp. 24, 25; 10, pp. 22, 23).—Data on the following are included: Italian prune leaf spot, peach shot hole, apple and pear scab, soft rot of apple fruit, trunk sampling for Dutch elm disease, crown gall tests on decorative evergreens, persimmon wilt, needle blight on fir, plane-tree disease spread, Berckman blight, a rare rust of cypress, survival of Dutch elm fungus at low temperature, butt rot in eastern oak, Swiss needle cast of fir, and Japanese cherry twig disease.

Some new species of Ascomycetes on coniferous hosts, E. K. CASH and R. W. DAVIDSON. (U. S. D. A.). (*Mycologia*, 32 (1940), No. 6, pp. 723-726, figs. 2).—The fungi described include one pyrenomycete and four discomycetes from conifers in various parts of the United States.

Damping-off of tree seedlings, E. WRIGHT. (U. S. D. A.) (*Amer. Nurseryman*, 72 (1940), No. 6, pp. 5, 6, 32-34).—This is a general discussion and summary of "control measures of damping-off on conifers and broad-leaved trees developed in investigations of the Federal Division of Forest Pathology."

New England mistletoe, R. J. ELARON and R. DOW (*New England Nat.*, No. 9, (1940), pp. 1-5, figs. 15).—A semipopular general account on dwarf mistletoe (*Arceuthobium pusillum*) in New England, including its distribution and hosts.

A new host for *Taphrina bacteriosperma*, W. W. RAY. (Okla. A. and M. Col.). (*Mycologia*, 32 (1940), No. 6, pp. 752-755, figs. 2).—The fungus was found parasitizing leaves of yellow birch (*Betula lutea*).

Breeding work toward the development of a timber type of blight-resistant chestnut.—Report for 1939, A. H. GRAVES (*Bul. Torrey Bot. Club*, 67 (1940), No. 9, pp. 773-777).—A further progress report (E. S. R., 81, p. 536).

Chlorosis of pin oaks and its control, P. P. PRONE (*Shade Tree*, 13 (1940), No. 12, pp. [2-6], fig. 1).—The symptoms of iron-deficiency chlorosis and methods of correction are described, and the results of successful control tests on shade trees are summarized. Because most New Jersey soils are acid, chlorosis is only a major problem there under certain local conditions where spraying or injection of iron salts and soil acidification are needed to correct the trouble.

Studies in *Ceratostomella montium*, M. TAYLOR-VINJE. (Univ. Wis.). (*Mycologia*, 32 (1940), No. 6, pp. 760-775, figs. 30).—The author reports on a study of ascus development in *C. montium* isolated from beetle galleries in lodgepole pine (*Pinus contorta* (=murrayana)).

Studies in forest pathology.—III, **Hypoxylon canker of poplar**, J. E. BIER (*Canada Dept. Agr. Pub.* 691 (1940), pp. 40, pls. 9, fig. 1).—The history and symptoms of this disease, due to *H. pruinatum*, are given. In Ontario it was found prevalent on *Populus tremuloides* and *P. grandidentata*. It possibly occurs on other species. Incipient cankers are always associated with wounds, in the Toronto region insect punctures usually serving as entrance courts. Infected bark of older cankers is heavily infested with the larvae of secondary bark-boring beetles. The fungus has been isolated from ascospores, conidia, and from diseased bark, and cultural studies were made. Inoculations on wounded tissue developed into cankers like those spontaneously produced. Trees 4-7 in. in diameter were girdled and killed 3½ yr. after inoculation.

Decay and other volume losses in wind-thrown timber on the Olympic Peninsula, Wash., T. S. BUCHANAN and G. H. ENGLEETH (*U. S. Dept. Agr., Tech. Bul.* 733 (1940), pp. 30, figs. 10).—Losses in timber blown down on this area by the storm of January 29, 1921, were found due to breakage, high stumps, and invasion by insects and fungi. Periodic examinations for 15 yr. thereafter indicated progressively increasing losses from insects and fungi. Breakage and high stump losses were greater than under normal logging conditions, but it was the deterioration through decay that finally resulted in the tremendous reduction in merchantable volume. Wind-thrown silver fir (*Abies amabilis*) and western hemlock (*Tsuga heterophylla*), irrespective of size, were rendered completely unmerchantable within 8 yr. Sitka spruces (*Picea sitchensis*) up to 118 in. in diameter were worthless after 15 yr. The heartwood of the larger trees (over 30 in. in diameter) of Douglas fir (*Pseudotsuga taxifolia* (=douglasii)) still contained considerable merchantable volume after 15 yr. on the ground. At the end of the study heartwood of wind-thrown western red cedar (*Thuja plicata*) was as sound as when the trees fell, only the sapwood zone having become decayed. The results show, however, that if deterioration is to be entirely avoided, trees of all the species studied must be salvaged within 1-2 yr. after falling.

Nitrogen content of sound and decayed coniferous woods and its relation to loss in weight during decay, R. E. HUNGATE (*Bot. Gaz.*, 103 (1940), No. 2, pp. 382-392).—Using methods described, determinations of the specific gravity and nitrogen content for sound and decayed woods of several coniferous species indicated but little change in total N during decay. Comparisons of the amount of wood disappearing during decay with the amount of available N

indicated that the amount of wood was 500-700 times as great as the total N available. As to the effects of added N, it appeared that the N present was utilized more effectively during decay than was that added. The efficiency of certain fungi in utilizing N may explain in part their great success in destroying wood.

Sap-stain, mould, and decay in relation to export shipments of British Columbia softwoods. H. W. EADES (*Canada Dept. Mines and Resources, Lands, Parks, and Forests Branch, Forest Serr. Cir. 57 (1940), pp. [2]+12*).—Sap stain and mold, and sometimes the surface mycelium of wood-rotting fungi, were found to grow on British Columbia softwoods during transit overseas, particularly on sapwood, when shipped in unseasoned condition. In some cases actual rot developed. Seasoning to a moisture content of 25 percent or less is recommended as a preventive method, and even 30 percent in the case of larger timbers aids in retarding attack. Chemical sprays and dips were found useful, but to insure their efficiency lumber should be at least partially seasoned following treatment.

ECONOMIC ZOOLOGY—ENTOMOLOGY

[**Work in economic zoology by the Cornell Station**] (*[New York] Cornell Sta. Rpt. 1940, pp. 104-105, 187-188*).—The work of the year (E. S. R., 82, p. 792) reported upon relates to the nutritional requirements of trout, by C. M. McCay, A. V. Tunison, and A. Phillips; the nutritive requirements for growth, fur production, and reproduction in foxes and minks, by S. E. Smith, J. K. Loosli, and R. Bernard; economics and biology of rodent pests in New York, with special reference to orchard mice, by W. J. Hamilton, Jr.; and life history, behavior, economic status, relation to land use, and management of the birds of New York, by A. A. Allen, P. P. Kellogg, G. M. Sutton, et al.

[**Work in economic zoology by the Oklahoma Station**] (*Oklahoma Sta. Bien. Rpt. 1939-40, pp. 95, 97-100, figs. 2*).—Brief reference is made to the effects of management practices with bobwhite quail, decline in number of quail due to lack of food, tests of feed plats, studies of the enemies of quail, quail production on the Lake Carl Blackwell game farm, and a study of fish in Lake Carl Blackwell.

[**Contributions on economic zoology and entomology**] (*Va. Acad. Sci. Proc., 1940, pp. 206-222*).—For these contributions abstracts are given as follows: Notes on the Control of the Fuller's Rose Weevil (*Pantomorus godmani* (Crotch)) on Kale, by H. G. Walker and L. D. Anderson (p. 206) (Va. Truck Expt. Sta.); The Effect of Attractants on Mosquitoes, by K. B. M. Crooks (p. 207); The Etiology of the *Beauveria* Disease of *Dendroctonus frontalis*, by J. G. Harrar and J. G. Martland (p. 211), The Biology of a Species of *Beauveria* From the Southern Pine Bark Beetle, by J. G. Harrar and R. P. Ellis (p. 211), and Morphology and Histogenesis of the Blood of the [Yellow] Mealworm (*Tenebrio molitor* L.), by H. W. Jackson (pp. 221-222) (all Va. A. and M. Col.); and Miscellaneous Studies of Codling Moth Bands, by A. M. Woodside (p. 212) and The Relative Importance of the Host Plants of the Tobacco Flea Beetle (*Epitrix parvula* F.), by E. H. Glass (pp. 213-214) (both Va. Sta.).

[**Wildlife research by the Texas Station**] (*Texas Sta. Rpt. 1939, pp. 125-180*).—The work of the year reported upon (E. S. R., 82, p. 507) includes wildlife resources surveys in Harris, La Salle, and Culberson Counties, by T. F. Smith, B. E. Ludeman, W. P. Taylor, and W. B. Davis; winter food of bobwhite, scaled, and Gambel quail and quail management in the coastal plains and prairie regions of Texas, both by V. W. Lehmann; the influence of cover control on food and

shelter for quail, by H. C. Hahn; genetic experiments with bobwhites, by E. H. Roesner and D. H. Reid; ecological wildlife relationships, by T. P. Chenault; present status of Texas bighorned sheep, by Davis and Taylor; wildlife and farming practices in eastern Texas, by W. H. Kellogg; beaver restoration, by A. H. Cook; pocket gophers of Texas, by Davis; summer food habits of gars, by K. Bonham; and habits of the armadillo, by F. W. Taber.

The digestive capacities of the white-tailed deer, E. B. FORBES, L. F. MARCY, A. L. VOIS, and C. E. FRENCH. (Pa. Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 5 (1941), No. 1, pp. 108-114, pl. 1).

Methods of increasing deer browse, L. W. KREFTING. (Minn. Expt. Sta.). (*Jour. Wildlife Mangt.*, 5 (1941), No. 1, pp. 95-102, pl. 1, fig. 1).

A respiration apparatus for serial work with small animals, particularly rats, M. KLEBER. (Calif. Expt. Sta.). (*Calif. Univ. Pubs. Physiol.*, 8 (1940), No. 15, pp. [2]+207-220, figs. 3).

A trap-removal census study of small mammals, V. H. CAHALANE (*Jour. Wildlife Mangt.*, 5 (1941), No. 1, pp. 42-67, pls. 2, figs. 11).—A study made of the mammals of the Chiricahua Mountains of southeastern Arizona during the field seasons of 1932 and 1933 with a view to determining the population of various species in the major habitats and evolving a method that would be useful elsewhere under similar conditions is reported. Considerable ecological data were gathered as a basis for possible conclusions.

Food habits of chipmunks, S. E. ALBOUS (*Jour. Mammal.*, 22 (1941), No. 1, pp. 18-24).—The high frequency of animal food, especially such forms as lepidopterous larvae and grasshopper eggs which were found in large quantities in the stomachs, indicates a beneficial influence on the part of chipmunks. It is very probable that during June and July, when insects are even more numerous in the forest than in August and September, they may be consumed in still greater quantities. The part chipmunks and other small rodents play in controlling forest insects is not known, but normal rodent populations often exceed in numbers the bird life in an area.

Identification of mice in genus *Peromyscus* by a red blood cell agglutination test, P. A. MOODY. (Univ. Vt.). (*Jour. Mammal.*, 22 (1941), No. 1, pp. 40-47, fig. 1).

Versatility in feeding and population maintenance of the muskrat, P. L. EBBINGTON. (Iowa Expt. Sta. et al.). (*Jour. Wildlife Mangt.*, 5 (1941), No. 1, pp. 68-89).—It was found that the muskrat may be selective or highly indiscriminate in its feeding, depending upon opportunities and necessity, individual tastes and habits, and what may be termed local custom. Certain foods, as ear corn and rootstocks of cattails and bulrushes, may be both preferred and of superior quality. Most green vegetation is more or less adequate as food in warm weather, and populations may winter on dry grass and weeds and cold-blooded prey, such as frogs, fishes, and mussels. Very harsh and innutritious fare, including corn cobs, rotting vegetation, and wood, may also be the principal diet of some animals for varying lengths of time in winter and spring. Because of this versatility in food utilization, muskrats of the agricultural north-central region are not often subject to rapid or outright starvation. Shortage or unavailability of food in combination with winter vicissitudes may on occasion result in decimation over wide areas, but the check that food deficiencies impose upon muskrat populations appears to be mainly indirect and, to at least some extent, psychological. Twenty-eight references to the literature cited are included.

Notes on the winter feeding of the muskrat in Delaware, L. A. STEARNS and M. W. GOODWIN. (Del. Expt. Sta.). (*Jour. Wildlife Mangt.*, 5 (1941), No. 1, pp. 1-12, fig. 1).

Severe parasitism in a raccoon (*Procyon lotor lotor* Linnaeus), B. B. MORGAN and E. F. WALLER. (Univ. Wis., Iowa State Col., et al.). (*Amer. Micros. Soc. Trans.*, 59 (1940), No. 4, pp. 523-527).—A sick female raccoon captured in Clayton County, Iowa, was found heavily infested by parasites. They included three ectoparasites (*Trichodectes crassus* Nitz., *Trichopsylla lotoris* Stewart, and *Ixodes cookei* Pack.), two nematodes (*Ascaris columnaris* Leidy and *Physaloptera* sp.), a coccidium resembling *Eimeria nuttalli* Yakim. and Matikasch., and a cestode resembling *Mesocystoides lineatus* Goeze. The raccoon is recorded as a new host for the trematode *Fibricola cratera* Barker and Noll, notes on the life cycle of which are included.

Winter and spring habits of weasels in central Iowa, E. B. POLDERBOER, L. W. KUHN, and G. O. HENDRICKSON. (Iowa Expt. Sta. et al.). (*Jour. Wild-life Mgmt.*, 5 (1941), No. 1, pp. 115-119, pl. 1).

[Reports of quail studies], H. L. STODDARD (*Coop. Quail Study Assoc. Ann. Rpts.*, 6 (1937), pp. 27; 7 (1938), pp. 31; 8 (1939), pp. 27).—Annual reports (E. S. R., 78, p. 508) of work with quail, their life and habits, food, enemies, diseases, protection, etc., under way in the Southeastern States.

[Oyster investigations by the New Jersey Stations] (*New Jersey Stat. Rpt.* 1940, pp. 102-104, fig. 1).—The work of the year (E. S. R., 83, p. 651) reported upon relates to the production of oyster seed, studies of the filtration of water by oysters, effect of a severe drought upon the oyster farmer, and pest control.

Studies on some early developmental stages of nematode worms, R. O. CHRISTENSON. (Ala. Polytech. Inst.). (*Jour. Tenn. Acad. Sci.*, 15 (1940), No. 4, p. 415).

A new cestode, *Cladotaenia oklahomensis*, from a hawk [*Buteo jamai-censis*], F. L. SCHMIDT. (Okla. A. and M. Col.). (*Amer. Micros. Soc. Trans.*, 59 (1940), No. 4, pp. 519-522, figs. 3).

Report of the Chief of the Bureau of Entomology and Plant Quarantine, 1940, L. A. STRONG (*U. S. Dept. Agr., Bur. Ent. and Plant Quar. Rpt.*, 1940, pp. 1-128).—The work of the year (E. S. R., 83, p. 83) on apple and pear insects included biological control studies on Comstock's mealybug and search for a substitute for lead arsenate for codling moth control, as well as investigations on the benefits from tree scraping and banding, biological-mechanical control and methods of determining the periods when spring-brood codling moths emerge and lay eggs, and insecticides in the Hudson River Valley on apple maggot control; peach insect investigations dealt with the value of mass liberations of *Macrocentrus ancylicorvus* Roh. for oriental fruit moth control, the use of ethylene dichloride for peach borer, the use of dichloroethyl ether against the plum curculio larvae in the soil, continuation of peach mosaic work, and tests for vectors of phony peach disease; work with grape insects included the practical use of cultivation and insecticides for grape berry moth; investigations on nut insects included field experiments for control and parasites of the hickory shuckworm on pecan, insecticide tests for control of pecan nut casebearer, observations on pecan leaf casebearer, and additional observations on distribution and parasites of filbert worm; dried-fruit insect investigations included information on the saw-toothed grain beetle as a pest of dried fruits and protection against crawling insects for stored raisins by trough barriers containing oil, studies on cold storage for control of dried-fruit insects, and a field study for causes of spoilage of mature vineyard grapes and relation to raisin moth; and subtropical fruit insect investigations included factors influencing results of red scale fumigation with cyanide and toxicants in oil, insecticide studies on citrus thrips, effect of sulfur on black scale and citrus rust mite, and influence of temperature on Florida red scale. Japanese beetle control by milky disease, nematodes, traps, insecticides, fumigants, and para-

flax, grain sorghum, Sudan grass, sorgo, broomcorn, cowpeas, buffalo and Angle-included.

Forest and shade tree insects mentioned are the Black Hills beetle, western pine beetle, elm bark beetle, ambrosia beetles, European spruce sawfly, Douglas fir twig weevil *Cylindrocopturus longulus* (Lec.), cedar shoot borer *Hypsipyla grandella* (Zell.), acitillo seed weevil *Apion martinezi* Marshall, and the gypsy and brown-tail moths.

Work with cereal and forage insects dealt with grasshoppers, the Mormon cricket, white-fringed beetle, chinch bugs, corn earworm, corn flea beetle as a vector of Stewart's disease of corn, European corn borer, hessian fly, pale western cutworm, armyworm and fall armyworm, control of stored grain pests, alfalfa weevil, the weevil *Hypera brunneipennis* (Boh.), pea aphid, *Lygus* sp. on alfalfa, vetch bruchid, and sugarcane borer.

Truck crop and garden insect investigations reported included work on tomato fruitworm, pea weevil, cabbage caterpillar, tobacco flea beetle, cigarette beetle, tobacco moth, sweetpotato weevil, wireworm, raspberry fruitworm, red berry mite, gladiolus thrips, red spider, orchid thrips, flower thrips, beet leafhopper, *Lygus* spp. on seed beets, Say's plant bug and another plant bug, *Thyanta custator* (F.), and false chinch bug.

Studies with cotton insects dealt with the bollweevil, leaf and root aphids, cotton flea hopper and other hemipterous pests, bollworm, pink bollworm, and the thurberia weevil.

Bee investigations included pollen studies, nectar secretion, American foulbrood, abnormal death losses in Utah, spotted brood, tests of commercial stock, biochemical differentiation of female castes, effect of feeding on weight of queens, artificial insemination, and notes on mating.

Investigations on insects affecting man and animals included work with screwworms and blowflies, horn flies, cattle grub, external parasites of sheep, goats, and cattle, fly sprays, mosquitoes, Clear Lake gnat, insect secretion, ticks, and the clothes moth and black carpet beetle.

Work with insecticides included testing of materials, fumigation investigations, physiology of insects, application of insecticides, insecticidal plants (tobacco, derris, pyrethrum, etc.), synthetic organic insecticide development, spray residues and removal, development of inorganic insecticides, fumigants, accessory materials for use with insecticides, toxicity of new insecticidal compounds to goldfish, and analytical investigations.

Inspection and quarantine work is also summarized. Plant disease studies (pp. 39-50, 61-66) are noted on page 768.

[Insect pest control] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1940, pp. 166-171*).—A progress report on control work with insect pests (*El. S. R., 82, p. 646*), including the Japanese beetle, white-fringed beetle, fruitflies, corn rootworm, oriental fruit moth, gypsy moth, Mormon cricket, grasshoppers, stored-grain insects, western pine beetle, Mexican bean beetle, cabbageworms, turnip aphid, gladiolus thrips, mites, European corn borer, hessian fly, alfalfa aphid, chinch bugs, and woolly apple aphid, as well as recent work on bees resistant to disease.

[Contributions on economic insects] (*U. S. Dept. Agr., Bur. Ent. and Plant Quar., Insect Pest Survey Bul., 17 (1937), Nos. 1, Sup., pp. 29-42; 3, Sups., pp. 111-116, pl. 1, pp. 117-150; 6, Sup., pp. 331-333; 7, Sup., pp. 381-383, pl. 1; 8, Sup., pp. 431-433, pl. 1; 9, Sups., pp. 473-482, pls. 3, pp. 483-590; 18 (1938), Nos. 1, Sup., pp. 33-50; 3, Sup., pp. 141-146; 4, Sup., pp. 225-240; 6, Sup., pp. 385-443; 7, Sup., pp. 515-517, pl. 1; 9, Sups., pp. 639-642, pp. 643-647, pl. 1, pp. 649-656, pls. 2; 19 (1939), Nos. 1, Sup., pp. 25-28, pls. 2; 3, Sup., pp. 103-109, pls. 4; 4, Sup., pp. 179-270, pl. 1; 7, Sup., pp. 483, 484, pl. 1; 8, Sups., pp. 527-534, pls. 3, pp. 535-538, pp. 539-543; 9, Sups., pp. 589-602, pp. 603-618, pls. 2, pp. 621-626;*

10, *Sup.*, pp. 649, 650; 20 (1940), Nos. 1, *Sups.* pp. 35, 36, pl. 1, pp. 37-39; 4, *Sup.*, pp. 209-211, pls. 2; 7, *Sup.*, pp. 429-431; 8, *Sup.*, pp. 483, 484, pl. 1; 9, *Sups.*, pp. 525-532, pls. 2, pp. 533-538).—These further contributions (E. S. R., 78, p. 216) are as follows:

Vol. 17.—(1) Alfalfa Weevil Survey, Fall of 1936, by W. C. McDuffie; (3) The Two Broods of Periodical Cicada Scheduled to Appear in 1937; and The Species and Distribution of Grasshoppers in the 1936 Outbreak, by R. L. Shotwell; (6) Spread of Alfalfa Weevil in 1937, by J. C. Hamlin; (7) Hessian Fly Survey, Harvest-Time 1937 (E. S. R., 78, p. 224); (8) Liberations of Parasites of the European Corn Borer in the United States in 1937, by C. A. Clark; and (9) Liberations of Japanese Beetle Parasites in the Eastern States in 1937, by J. L. King; and Insect Notes From Costa Rica in 1936, by C. H. Ballou (E. S. R., 78, p. 220).

Vol. 18.—(1) Alfalfa Weevil Survey, Fall of 1937, by W. C. McDuffie, F. V. Lieberman, and R. W. Bunn; (3) Notes on Tobacco Insects in 1937, by W. C. Nettles; (4) Population and Host Preferences of June Beetles in Southern Wisconsin in 1935, 1936, and 1937, by T. R. Chamberlin, C. L. Fluke, L. Seaton, J. A. Callenbach, and P. O. Ritcher; (6) The Species and Distribution of Grasshoppers in the 1937 Outbreak, by R. L. Shotwell; (7) Hessian Fly Survey at Harvest-Time, 1938; and (9) Spread of Alfalfa Weevil in 1938, by J. C. Hamlin; Relative Abundance of the European Corn Borer in 1938, by W. A. Baker and A. M. Vance; and The Field Status of Parasites of the European Corn Borer in the Fall of 1937, by W. G. Bradley and C. A. Clark.

Vol. 19.—(1) Colonization of Japanese Beetle Parasites in the Eastern States in 1938, by J. L. King; (3) Populations and Host Preferences of June Beetles in Southern Wisconsin in 1938, by T. R. Chamberlin, C. L. Fluke, L. Seaton, and J. A. Callenbach; (4) The Species and Distribution of Grasshoppers in the 1938 Outbreak, by R. L. Shotwell; (7) Hessian Fly Survey at Harvest Time, 1939, summarized by W. B. Cartwright; (8) The Field Status of Parasites of the European Corn Borer in the Fall of 1938, by W. G. Bradley and C. A. Clark; Estimates of Damage by the European Corn Borer in 1938 and a Comparison With 1937 Estimates, by A. M. Vance; and Spread of Alfalfa Weevil in 1939, by J. C. Hamlin; (9) Distribution and Food Plant Records of *Paratetranychus citri* McG., *P. ilicis* McG., *P. pilosus* C. & F., *Tetranychus pacificus* McG., and *T. telarius* L., by J. E. Mabry and M. M. Walton; Status of the European Corn Borer in 1939, by A. M. Vance; and Colonization of European Corn Borer Parasites in 1939, by C. A. Clark and W. G. Bradley; and (10) European Corn Borer.

Vol. 20.—(1) Populations of Chinch Bugs in Hibernation, November-December 1939; and Estimates of Damage by the European Corn Borer in 1939, by A. M. Vance; (4) Colonization of Japanese Beetle Parasites in 1939, by J. L. King and L. B. Purker; (7) Alfalfa Weevil Scouting, 1940, by J. C. Hamlin; (8) Hessian Fly Survey at Harvest Time 1940, summarized by W. B. Cartwright; and (9) The Field Status of Parasites of the European Corn Borer at the Close of the 1939 Season, by W. G. Bradley and C. A. Clark; and Colonization of European Corn Borer Parasites in 1940, by C. A. Clark and W. G. Bradley.

Montana insect pests, 1939 and 1940, H. B. MILLS (*Montana Sta. Bul.* 38½ (1941), pp. 28, figs. 8).—This biennial report (E. S. R., 80, p. 796) contains a review of the Montana grasshopper and Mormon cricket control programs in 1939 and 1940, includes notes on clover insects for the years, namely, the clover seed midge, clover root borer, and clover aphid, and discusses the following grain insects: The granary weevil, saw-toothed grain beetle, flat grain beetle, broad-horned flour beetle *Gnathocerus cornutus* (F.), confused flour beetle, foreign grain beetle *Ahasverus advena* (Waltl.), yellow mealworm, dark mealworm,

cadelle, meal moth, Mediterranean flour moth, Indian-meal moth, Say's stinkbug, and grass plant bugs. Notes are also included on the following miscellaneous insects: The potato and tomato psyllid, pear psylla, lettuce root aphid *Pemphigus bursarius* (L.), spruce gall lice, striped cucumber beetle, strawberry rootworm *Paria canella* (F.), red turnip beetle, soft-winged flower beetle *Malachius aeneus* (L.), alfalfa weevil, sugar beet webworm, alfalfa looper, armyworm, pale western cutworm, codling moth, termites, Alpine rock crawler *Grylloblatta campodeiformis* Walk., and earwigs.

[Entomological work of New Jersey Stations] (*New Jersey Stat. Rpt. 1940*, pp. 46-47, 51, 53-54, 60, 61, 67, 75-76, 92-95, 99, fig. 1).—Brief progress report (E. S. R., 83, p. 651) on codling moth, peach tree borer, cranberry weevil, blunt-nosed leafhopper *Euscelis striatulus* Fall., six-spotted leafhopper in relation to lettuce yellows, carrot weevil, corn earworm, wireworms, European corn borer, red spiders, mosquitoes, honey production, nonpoisonous sprays for control of leaf-eating insects on shade trees and shrubs, climate and insect control, devil's shoestring as an insecticide, and arsenical substitutes.

[Work in entomology by the Cornell Station]. (Partly coop. U. S. D. A. et al.). ([*New York*] *Cornell Sta. Rpt. 1940*, pp. 126-135).—The work of the year (E. S. R., 82, p. 792) reported upon includes the following: The alfalfa snout beetle, by H. H. Schwardt and C. G. Lincoln; white grubs and other forage crop pests, by Schwardt and T. W. Kerr, Jr.; Mexican bean beetle, by Schwardt and M. Ramsay; biology and control of cutworms, by C. E. Palm and W. D. Wylie; nonpoisonous sprays, by T. R. Hansberry and L. B. Norton; onion thrips, by T. C. Watkins and W. H. Ewart; potato insect investigations on Long Island, by W. A. Rawlins, Lincoln, Watkins, and J. O. Nottingham; efficiency of spraying and dusting practices in protecting potatoes grown on muck soils, by Rawlins, Watkins, and J. N. Roney; wireworms and potato injury, by Rawlins and R. E. Olson; potato rotation studies, by Rawlins and K. B. Nash; varietal resistance of plants to insect attacks, by Rawlins, Watkins, Ewart, and Roney; Dutch elm disease work, by D. L. Collins, H. Dietrich, D. Connola, and L. E. Hagmann; sulfur and sulfur compounds in relation to insect control, by Hansberry, Palm, G. E. Carman, and E. Stafford; and fumigation for control of two common clothes moths and dermestids injurious in dwelling houses, and the economic aphids of New York, all by G. H. Griswold.

[Insect investigations by the Oklahoma Station] (*Oklahoma Sta. Bienn. Rpt. 1939-40*, pp. 77-95, figs. 11).—Brief notes on progress (E. S. R., 81, p. 68) include studies of grasshopper baits, by F. E. Whitehead; location of green bug infestations by aerial survey, by Whitehead and F. A. Fenton; cotton flea hopper, by E. Hixson; control of melon louse, by Fenton and Whitehead, and crickets (*Daikinia brevipex* Hald.), by Whitehead, and the white grub *Phyllophaga lanceolata* (Say), by R. Dahms, Fenton, and Whitehead; varietal resistance to corn earworm, by Fenton; stored wheat pests, by Fenton and F. T. Dines; resistance of sorghum hybrids to chinch bugs, by Dahms, Fenton, J. E. Webster, and C. B. Cross; flies and mosquitoes as related to anaplasmosis, by D. E. Howell, L. E. Rozeboom, and L. H. Moe (coop. U. S. D. A.); conservation activities in relation to mosquitoes, by Rozeboom; materials for killing flies in manure, by Howell; bee studies, by G. A. Bieberdorf; and orchard and shade tree pests by Fenton.

[Entomology work by the South Dakota Station] (*South Dakota Sta. Rpt. 1940*, pp. 61-62, fig. 1).—A brief progress report of work by H. C. Severin, N. P. Larson, and G. B. Spawen (E. S. R., 82, p. 647) on electrocutor traps for grasshopper control, the life history of the confused grasshopper *Melanoplus confusus* (Say), and blister beetle control.

[Work in entomology by the Texas Station]. [Partly coop. U. S. D. A., Iowa and Wyo. Expt. Stas., et al.]. (*Texas Sta. Rpt. 1939*, pp. 51-62, 118-120,

121, 230, 232, 244-246, 251, 254-255, 256-257, 259, 261, 284-286).—The work of the year reported upon (E. S. R., 82, p. 507) relates to the biology, control, and taxonomy of white grubs, by H. J. Reinhard; the bollweevil, its migration, hibernation, and control, by F. L. Thomas, J. C. Gaines, and Reinhard; the cotton flea hopper, including migration and dispersal, abundance, host plants, varietal resistance, influence of strip planting, other planting practices, and rotations and fertilizers upon infestations, hibernation, and control, by Gaines, R. K. Fletcher, S. E. Jones, W. L. Owen, Jr., Thomas, Reinhard, J. R. Quinby, and J. C. Stephens; the pink bollworm, by Thomas and A. J. Chapman; the biology and natural control of the cotton bollworm, by Fletcher; cotton thrips, by Gaines and Fletcher; pecan insect studies, by S. W. Bil-ling; devil's shoestring as an insecticide, by V. A. Little and G. A. Russell; investigations of truck crop insects, including the control of the turnip aphid, harlequin bug, cabbage looper, and common red spider, by M. J. Janes and H. Menusan; injury to range grasses by desert termites, by W. S. McGregor and Thomas; damage to flax by the stinkbug *Chlorochroa ligata* Say, by Menusan and Thomas; the leaf crumpler (*Mineola indigenella*) injurious to ornamentals, by Fletcher; the flatheaded apple tree borer as a rose pest, by Owen; apiary inspection, by C. E. Heard and W. C. O'Neal; activities of bees, by H. B. Parks; adaptability of native plants for bees, queen rearing, bee resistance studies, and horsemint for honey and oil production, all by Parks and A. H. Alex; at the Sonora Substation, external parasites of sheep and goats, by O. G. Bubcock, J. O. Stovall, S. W. Clark, and I. B. Boughton; at the Weslaco Substation, citrus insect (rust mite and scale insect) studies and control of cabbageworms, tomato fruitworm, garden flea hopper, potato psyllid, and of the cotton bollweevil and thrips on cotton, all by T. B. Randolph, and control of white grubs and the beet webworm, by Randolph and P. T. Riherd; and at the Winter Haven Substation, studies for vectors of eggplant yellows and control of tomato fruitworm and beet leafhopper, by Jones, onion thrips control tests by Jones and Menusan, and notes on the lesser cornstalk borer, potato leafhopper on beans, cabbage webworms, desert termites, and the stinkbug *C. ligata* Say, by Jones.

[Entomological investigations by the Utah Station] (*Utah Sta. Bul.* 294 (1940), pp. 12-13, 32-35, 41-43, 57-60, 61, 71-72, 73, 92-93, figs. 9).—A brief progress report (E. S. R., 80, p. 367), including notes on alfalfa insects (pale western cutworm and *Lygus* sp.), Mormon crickets, grasshoppers (coop. U. S. D. A.), the beet leafhopper, tomato fruitworm, pea aphid, peach twig borer, stinkbugs, strawberry root weevils (*Brachyrhinus ovatus* (L.) and *B. rugosostriatus* Goetze), and bee investigations.

[Contributions in entomology]. (Utah Expt. Sta.). (*Utah Acad. Sci., Arts, and Letters. Proc.*, 16 (1938-39), pp. 43-73, figs. 2).—Contributions presented include Grasshopper Control in Utah, 1938, by G. F. Knowlton (pp. 42-47) (coop. U. S. D. A. et al.); A New *Myopa* From Utah (Diptera), by G. S. Stains and G. F. Knowlton (p. 51); Some Entomophagous Utah Hymenoptera, by G. F. Knowlton and F. C. Harmston (pp. 59-63); Studies of Western Aphids, by G. F. Knowlton and D. L. Bischoff (p. 69); and A New *Scellus* (Dolichopodidae: Diptera) With Key to Males, by F. C. Harmston (pp. 71-73).

[Entomological investigations by the West Virginia Station] (*West Virginia Sta. Bul.* 298 (1940), pp. 28-29).—Brief notes on progress (E. S. R., 80, p. 796) of studies relating to weather records and insect control, ants v. codling moths, and spray investigations.

[Contributions on economic entomology] (*Ztschr. Angew. Ent.*, 26 (1939), Nos. 1, pp. 1-183, figs. 74; 2, pp. 185-367, figs. 82; 3, pp. 367-544, figs. 85; 26 (1940), No. 4, pp. 545-863, figs. 56).—Contributions presented (E. S. R., 82, p. 253) are as follows:

No. 1.—Penetration of the Tracheae by Different Fluids and the Results, by H. Gähler (pp. 1-62); The Parasitization of the Nun Moth by Insects—I, Investigations of the Life History and Habits of the Tachinid Parasite *Parasetigena segregata* Rond. (= *Phorocera agilis* R.-D.) in the Rominten Heath District in 1935, With Observations on Hymenopterous Parasites, by E. von Finck (pp. 104-142), and II, The Variation in Abundance of the Tachinid Parasite *Parasetigena segregata* Rond. in the Rominten Heath District, by O. F. Niklas (pp. 63-103); Investigations of the Action of the Sex Scent in the Grape Moths *Olysia ambiguella* and *Polychrosis botrana*, by B. Götz (pp. 143-164); Further Tests of Naaki Against the Granary Weevil in 1933, by A. Claus (pp. 165-170); The Rearing of *Phlugiola duhlemica* Wd. Eichl. (Orthopt.: Tettigoniid.), by W. Eichler (pp. 171-179); and The Control of Spider Mites by Use of Adhesives, by P. Steiner (pp. 180-183).

No. 2.—The Biology of the Pine Geometrid (*Bupalus piniarius* L.) Parasite *Ichneumon nigrarius* Grav., by W. Thalenhorst (pp. 185-208); *Oeutorhynchus suturalis* F., a Little-Known Pest of Onions, by O. Jancke and G. Nietzsche (pp. 209-214); Investigations of the Movements of the Larvae of May Beetles (*Melolontha melolontha* L. and *M. hippocastani* F.), by F. Schwerdtfeger (pp. 215-252); Contributions to the Biology and Anatomy of Mites Infesting Houses, by H. Oboussier (pp. 253-296); The Biology of *Pemphigus spirothecae* Pass., by L. Tóth (pp. 297-311); The Alfalfa Weevil, by O. Kaufmann (pp. 312-358); and Mortality and Growth of Larvae of the Pine Geometrid Fed on Pine Needles From Pure Stands and From Mixed Forests, by F. P. Müller (pp. 359-367).

No. 3.—The Alfalfa Weevil, by O. Kaufmann (pp. 387-488); Contributions to the Forest Entomology of Turkey—II, Some Pests of Hazelnut Culture, by E. Schimitschek (pp. 449-461) (E. S. R., 82, p. 354); Investigations of the Beet Leaf Sawfly *Athalia colibri* Christ. (*A. spinarum* F.), by E. Riggert (pp. 462-516); Studies of the Entomophthoraceae, V, VI, by G. Lakon (pp. 517-521) (E. S. R., 73, p. 644); Observations of the Effect of *Empusa weberi* Lakon on the Larvae of *Raphidia ophiopsis* L., by H. Weber (pp. 522-535); and Investigations of the Coleopterous and Dipterous Fauna of Pastures, by B. Schaerffenberg (pp. 536-544).

No. 4.—The Outbreak of *Ips scedentatus* Börner in the *Picea orientalis* Districts, by E. Schimitschek (pp. 545-588); the H-ion Concentration and Buffering Power of the Contents of the Intestines of *Olysia ambiguella*, *Polychrosis botrana*, and Some Other Insects and Their Foods, by T. Staudenmayer and F. Stellwaag (pp. 589-607); Exact Mimicry Investigation and Applied Entomology, by F. Heikertinger (pp. 608-623); and Descriptions of New Genera and Species of the Family Trichogrammatidae (Hym.: Chalcidoidea) From the Palearctic Region, With Notes—Supplement, by S. Nowicki (pp. 624-663) (in English).

Insect outbreaks in Europe, J. R. CARPENTER (*Jour. Anim. Ecol.*, 9 (1940), No. 1, pp. 103-147, figs. 11).

[Contributions on economic insects] (*Indian Jour. Ent.*, 1 (1939), No. 1-2, pp. 17-105, figs. 20).—Contributions presented include the following: Ecological Studies on the Spotted Bollworms of Cotton and Their Parasites—I, The Pre-imaginal Development and Viability of *Haris fabia* and *Microbracon lefroyi* Under Different Conditions of Temperature and Humidity, by T. Ahmad and G. Ullah (pp. 17-47); The Influence of Dust-Storms on the Migrations of the Desert Locust, by D. Bhatia (pp. 49-51); A Note on the Change in the Status of Mango-Hopper (*Idiocerus clypealis*: Jassidae) in North Sind, by H. Khan (pp. 53-54); A Note on Phase Transformation in *Locusta migratoria*, by R. L. Gupta (pp. 55-56); Observations on the Reactions of the Dermestid Beetle *Trogoderma klugera* Arr. to Light, by K. A. Rahman and G. Singh Sohi (pp. 57-63); Descriptions of New and Records of Some Known Chalcidoid and Other Hymen-

opterous Parasites From India, by M. S. MANI (pp. 69-90); and The Fruit Fly *Dacus ferrugineus* Fabr. and Its Variety *dorsalis* Hendel in North West India, by H. K. MUNRO (pp. 101-105).

The bionomics of entomophagous insects, II, W. V. BALDUF (*St. Louis, Mo.: John S. Swift Co.*, [1939], pt. 2, pp. [3]+384, figs. 228).—This is the second (E. S. R., 78, p. 515) of a series planned to treat the general subject bionomics of entomophagous insects. It embraces the orders Lepidoptera, Trichoptera, Mecoptera, and Neuroptera.

An illustrated laboratory manual of parasitology, R. M. CABLE (*Minneapolis, Minn.: Burgess Pub. Co.*, [1940], pp. V+108, figs. 104).

A comparison of the transmission of four cucurbit viruses by cucumber beetles [the western striped cucumber beetle and the western spotted cucumber beetle] and by aphids, J. H. FREITAG (*Phytopathology*, 31 (1941), No. 1, p. 8).

Pea aphid and pea weevil control, H. GLASGOW. (N. Y. State Expt. Sta.). (*Canner*, 91 (1940), No. 4, pp. 12, 20).

Principal potato insects of Iowa and their control, H. C. MANIS and H. GUNDERSON (*Iowa Sta. Bul. P18, n. ser.* (1941), pp. 509-516, figs. 5).—A practical account.

The role of insects in the pit scab of potatoes, A. A. GRANOVSKY and A. G. PETERSON (*Phytopathology*, 31 (1941), No. 1, pp. 9-10).

Insect transmission, host range, and properties of squash-mosaic virus, J. H. FREITAG (*Phytopathology*, 31 (1941), No. 1, p. 8).

Insects injurious to wheat [trans. title], A. F. DE SEABRA (*Arg. Secç. Biol. e Parasitol., Mus. Zool. Univ. Coimbra*, 3 (1939), pp. XIV+[1]+699+13).—This work, presented in four parts and an appendix, lists by orders and families and briefly considers the insect forms injurious to wheat, their natural enemies, etc. A list of the principal wheat insects, as reported by leading authorities of the more important wheat-producing countries of the world, and a bibliography of 42 pages are included.

Control of aphid and scale in Virginia apple orchards in 1940, W. S. HOUGH. (Va. Expt. Sta.). (*Va. State Hort. Soc. Rpt.*, 45 (1940), pp. 120-123).—Report is made of the progress of control work with the rosy apple aphid and scurfy scale in apple orchards in 1940, details of which are given in tables.

The status of citrus pests following the recent cold (*Fla. State Hort. Soc. Proc.*, 53 (1940), pp. 64-72, fig. 1).—Two contributions are presented, the first by R. L. MILLER (pp. 64-67) and the second from the Florida Experiment Station by W. L. THOMPSON (pp. 67-72). They relate to the effect upon the insect and mite enemies of citrus of the cold wave that visited Florida from January 26 to 29, 1940, with a temperature at Lake Alfred as low as 17.3° for 2 hr.

Life history and control of destructive nursery insects in Oklahoma, F. A. FENTON. (Okla. A. and M. Col.). (*South. Florist and Nurscryman*, 49 (1940), No. 26, pp. 5, 28-29).

Some outstanding needs for research in tree husbandry—entomology, J. S. HOUSER. (Ohio Expt. Sta.). (*Natl. Shade Tree Conf. Proc.*, 15 (1939), pp. 81-85).

Second survey of the wood-destroying insects in public buildings in Sweden, I. TRÄSÄRDH (*Bul. Ent. Res.*, 31 (1940), No. 3, pp. 287-294, figs. 4).—This further contribution (E. S. R., 80, p. 227) consists of a short summary of the results of the survey that has been continued in Svealand in the middle part of Sweden.

Studies on the thermal death points and heat tolerance of eggs of *Heterakis gallinae* and *Ascaridia lineata*, H. H. EARL, JR., H. HOWELL, and R. O. CHRISTENSON. (Ala. Expt. Sta.). (*Jour. Tenn. Acad. Sci.*, 15 (1940),

No. 4, p. 416).—The thermal death points of eggs of *H. gallinae* and *A. galli* were found to be between 134° to 136° and 138° to 140° F., respectively. "Preliminary studies on heat tolerance have proved the ability of eggs of *H. gallinae* to withstand lengthy exposures to temperatures below the coagulation point of protoplasm. At relatively low temperatures, i. e., between 34° and 44° C. (93° and 111° F.), no appreciable mortality occurred over an extended period of time. At median temperatures of 47° and 50°, however, there was a decrease in percentage viability in proportion to the time element. Total mortality occurred at both temperatures when cultures were incubated beyond 4 hr. and 45 min. At 55° total mortality was obtained after 3 hr. of incubation. At 57.8° death was instantaneous. The viability of controls ranged from 50 to 81 percent."

The parasitism of economic insects by fungi, J. (I. HARRAR, J. J. McKELVEY, and J. W. SHOWALTER (*Phytopathology*, 31 (1941), No. 1, p. 10).

Work on the control of insect pests, T. J. NAUDE (*Farming in So. Africa*, 15 (1940), No. 177, pp. 513-516, fig. 1).—This is the annual report of the division of entomology of the department of agriculture of the Union of South Africa.

New facts about oil sprays, P. J. CHAPMAN. (N. Y. State Expt. Sta.). (*Amer. Fruit Grower*, 61 (1941), No. 2, pp. 9, 30-31, 34-35, figs. 2).

Time interval in double fumigation, H. J. QUAYLE. (Calif. Citrus Expt. Sta.). (*Calif. Citroq.*, 26 (1940), No. 1, p. 4).

Physiological characteristics of the diapause grasshopper egg.—I, The stability of the diapause condition, J. H. BODINE and W. A. ROBBIE (*Physiol. Zool.*, 13 (1940), No. 4, pp. 391-397, figs. 3).—The stability of the diapause state in the egg of the differential grasshopper was studied by subjecting eggs to various experimental conditions and determining the number of individuals starting active development after the treatment. The stability of the diapause state varies with the age of the eggs, the younger ones being relatively resistant to all the treatments used, while the older ones are more easily induced to resume growth. Treatments which were most effective in breaking diapause in old eggs are drying and wetting, centrifugation, exposure to nitrogen, and temperatures of 10° and 36° C. Exposure to oxygen, carbon dioxide, and hypertonic sodium chloride solutions resulted in a smaller number of eggs breaking diapause than in the control groups. A discussion is given of the possible correlation of the egg behavior with water balance, level of metabolism, or cellular structure.

The distribution and migrations of *Locusta* in Europe, Z. V. WALOFF (*Bul. Ent. Res.*, 31 (1940), No. 3, pp. 211-246, figs. 4).—This review is presented with a list of 103 references to the literature.

The life history of the American cockroach (*Periplaneta americana* Linn.) (Orthop.: Blattellidae), P. RAU (*Ent. News*, 51 (1940), Nos. 5, pp. 181-124; 6, pp. 151-155; 7, pp. 186-189; 8, pp. 223-227; 10, pp. 273-278).

A review of the genus *Ankothrips* D. L. Crawford (Thysanoptera), S. F. BAILEY. (Univ. Calif.). (*Pan-Pacific Ent.*, 16 (1940), No. 3, pp. 97-106, figs. 24).—Included in this review is a key to the species of *Ankothrips*, a description of *A. notabilis* n. sp., from laurel, manzanita, and plum blossoms in Mix Canyon, Solano County, Calif., and a catalog of the 10 species recognized.

Thrips attacking citrus fruits in Florida, W. L. THOMPSON. (Fla. Expt. Sta.). (*Fla. State Hort. Soc. Proc.*, 53 (1940), pp. 56-61, pls. 2).—Noted from another source (*E. S. R.*, 84, p. 645).

Development, hatching, and mortality of the eggs of *Cimex lectularius* L. (Hemiptera) in relation to climate, with observations on the effects of preconditioning to temperature, C. G. JOHNSON (*Parasitology*, 32 (1940), No. 4, pp. 127-178, figs. 13).

Immature nutfall of coconuts in the Solomon Islands, J. S. PHILLIPS (*Bul. Ent. Res.*, 31 (1940), No. 3, pp. 295-316, pl. 1, figs. 4).—It is concluded from the experiments and observations summarized that the coreid *Amblypelta cocophaga* is the main agent responsible for the immature nut fall of coconuts in the Solomon Islands. The bug is thought to have come from the bush, and the area of invaded plantations is said to be slowly spreading.

A preliminary report on the control of Comstock's mealybug on apple, J. A. Cox. (Va. Expt. Sta.). (Va. State Hort. Soc. Rpt. 45 (1940), pp. 84-88).—In 1940 two applications of Loro, consisting of aliphatic thiocyanates (1:800), for each of the first and second broods applied when the mealybugs were in the first and second instars gave satisfactory control. Three applications of 40 percent nicotine sulfate (1:400) were fairly effective in controlling the young crawlers. Two applications of summer oil for the second-brood crawlers, used at the rate of 1 gal. to 100 gal. of spray, did not give satisfactory control but when combined with rotenone-bearing insecticides showed promising results. It is concluded from these findings that in a heavily infested orchard there may be a sufficient number of the mealybugs left on the tree to cause considerable damage to the fruit at harvesttime, even if an insecticide has killed from 90 to 95 percent of the individuals of the first and second broods.

A fungous parasite of the mealy bug, V. K. CHARLES, J. N. COUGH, J. G. HARRAR, and J. J. McKELVEY, JR. (*Phytopathology*, 31 (1941), No. 1, p. 5).—Report is made of finding an undescribed fungus in August 1940 to kill nearly all the adult Comstock's mealybugs in orchards near Roanoke and to occur at Winchester, Va. In infection experiments mealybugs have been readily killed in the laboratory and greenhouse.

Notes on dictyospermum scale infesting citrus, W. L. THOMPSON. (Fla. Expt. Sta.). (*Citrus Indus.*, 21 (1940), No. 11, pp. 5, 9).—These notes relate to the dictyospermum scale, known in Florida for a number of years as a major pest of avocado and some other plants, which has appeared on citrus in Lake, Orange, and southwest Seminole Counties.

Parasites of the black scale (*Saissetia oleae*) in Africa, H. COMPERE. (Calif. Citrus Expt. Sta.). (*Hilgardia* [California Sta.], 13 (1940), No. 7, pp. 187-425, figs. 7).—This paper records notes on the black scale in Africa and the search for parasites, including methods of packing parasitized black scales, shipping, and propagation and colonization of black scale parasites. A key (pp. 396-397) is presented which separates the females of the genus *Coccophagus* that are parasitic in the black scale, namely, *C. birittatus* Comp., *C. basalis* Comp., *C. ochraceus* How., *C. flavidus* n. sp., *C. rusti* Comp., *C. specialis* Comp., *C. oosperi* Girault, *C. eleophilus* Silv., *C. pulcinariae* Comp., *C. eritreensis* Comp., *C. baldassarii* Comp., *C. anthracinus* Comp., *C. trifasciatus* Comp., *C. fallax* Comp., *C. saintebecki* Girault, *C. nigrinus* Comp., *C. heteropneusticus* Comp., *C. yoshidae* Nakayama, *C. nubes* Comp., *C. spectabilis* Comp., *C. coracinus* n. sp., and *C. capensis* Comp. Species treated other than those belonging to the genus *Coccophagus* were *Coccidozenus niloticus* n. sp., *Diversinervus masakaensis* n. sp., *D. smithi* n. sp., *Encyrtus fuliginosus* n. sp., *Eucanthellus* sp., *Mesopeltis* sp., *Metaphycus helvolus* (Comp.), *M. lounsburyi* (How.), *M. natalensis* Comp., *M. stanleyi* Comp., *Microterys kenyaensis* Comp., *M. saissetiae* Comp., and *Sentelista cyanea* Motschulsky. Two hyperparasites are mentioned, *Bacoanusia minor* (Silv.) and *Tetrastichus infiriosus* Comp.

There are two strains of red scale, D. L. LINDGREEN. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 26 (1941), No. 3, p. 72).

The control of Coccidae on coconuts in Seychelles, D. VESEY-FITZGERALD (*Bul. Ent. Res.*, 31 (1940), No. 3, pp. 253-283, pls. 2).

Status of biological control of scale pests, H. S. SMITH. (Calif. Citrus Expt. Sta.). (*Calif. Citrog.*, 26 (1941), No. 3, pp. 58, 76-77, figs. 3).

The biology of the small white butterfly *Pieris rapae*, with special reference to the factors controlling its abundance, O. W. RICHARDS (*Jour. Anim. Ecol.*, 9 (1940), No. 2, pp. 243-288).—In this contribution the author deals with the general biology, methods of estimating population density, and factors affecting population density of the imported cabbageworm.

Chemical factors determining the choice of food plants by *Papilio* larvae, V. G. DETHIER (*Amer. Nat.*, 75 (1941), No. 756, pp. 61-73).

Control of the oriental fruit moth by mechanical means, G. E. MARSHALL. (Ind. Expt. Sta.). (*Amer. Fruit Grower*, 61 (1941), No. 2, pp. 15, 36-37, figs. 2).

Investigations of caterpillars attacking tomatoes in northern California during 1939, A. E. MICHELbacher, G. F. MACLEOD, and W. M. HOSKINS (*California Sta. Bul.* 644 (1940), pp. 20, figs. 6).—An account of the tomato pinworm, potato tuber worm, tomato and tobacco worms, armyworms (the beet armyworm and *Prodenia praefica* Grote), alfalfa looper, and corn earworm as tomato pests, with notes on the flight habits and control measures (including information on residue removal) for the corn earworm.

Effects of some ingested insecticides on the midgut wall of the southern armyworm larva, P. A. WOKE. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 5, pp. 321-329, pls. 5).—Larvae of the sixth-instar southern armyworm were fed certain insecticides by the sandwich method, then killed, and tissues of the midgut wall prepared by histological methods for examination and comparison with larvae that had not ingested poison. The effects of the following insecticides were studied in this way: Acid lead arsenate, paris green, calcium arsenate, calcium arsenite, arsenic trioxide, barium fluosilicate (20 percent silica), sodium fluoride, sodium fluoaluminate, rotenone, and phenothiazine.

Disintegration of the midgut epithelial cells and damage to the midgut muscle fiber followed the ingestion of arsenicals. The substance of the cytoplasm and nuclei of the epithelial cells decomposed following the ingestion of NaF. In larvae that had ingested sodium fluoaluminate, the epithelial cells were disintegrated and the cross striations of the muscle fibers were faint or obliterated. No obvious changes in the epithelial cells or muscle fibers could be noted in the larvae that had ingested barium fluosilicate, phenothiazine, and rotenone.

Control of tomato fruit worm and corn ear worm, S. MARCOVITCH and W. W. STANLEY (*Tennessee Sta. Cir.* 72 (1940), pp. 4, figs. 4).—A practical account.

Oviposition in gall midges (Cecidomyiidae) affecting seed production in grasses, D. P. JONES (*Jour. Anim. Ecol.*, 9 (1940), No. 2, pp. 328-335, fig. 1).—It has been found that in certain species of gall midges affecting seed production in grasses, particularly *Contarinia merceri* on *Alopecurus pratensis*, oviposition exhibits a diurnal periodicity. In favorable weather, oviposition occurs mainly between 5 p. m. and 8 a. m. (G. M. T.), with a crest shortly before sunset and another sometime after sunrise. Oviposition is very much influenced by the intensity of the light and the velocity of the wind. Contrary to expectations, the time of flowering of the host grass appears to have no relation to the time of oviposition.

Two new California Dolichopodidae (Diptera), F. C. HARMSTON and G. F. KNOWLTON. (Utah Expt. Sta.). (*Pan-Pacific Ent.*, 16 (1940), No. 3, pp. 108-110, figs. 4).

Bembix wasps as enemies of sheep blow-flies, G. C. ULLYETT and A. H. DE VRIES (*Farming in So. Africa*, 16 (1941), No. 178, pp. 19-20).—The present knowledge of the habits of wasps of the genus *Bembix*, particularly *B. olivata*,

which capture and carry away adult blowflies, thus being of value as a factor in controlling the blowfly complex, is reviewed.

Flight records of Phyllophaga (Coleoptera: Scarabaeidae), H. K. HENRY and C. E. HERT (*Ent. News*, 51 (1940), No. 10, pp. 279-282).

Experimental studies on the duration of life.—XVI, Life tables for the [confused] flour beetle (*Tribolium confusum* Duval), R. PEARL, T. PARK, and J. R. MINER (*Amer. Nat.*, 75 (1941), No. 756, pp. 5-19, figs. 2).

The prevention of outbreaks of the pine beetles under war-time conditions, S. HANSON (*Bul. Ent. Res.*, 31 (1940), No. 3, pp. 247-251).

Relation of proteolytic enzymes to phase of life cycle of *Bacillus* larvae and two new culture media for this organism, E. C. HOLST and A. P. STURTEVANT. (U. S. D. A. and Univ. Wyo.). (*Jour. Bact.*, 40 (1940), No. 5, pp. 723-731).—The findings presented indicate that the proteolytic enzymes found in honeybee larvae infected with *B. larvae*, or in scales of larvae dead from such infection, are not elaborated by the honeybee larval organism. "Larvae in the pre-cleaved stage, at which time they are consuming pollen and honey, do contain enzymes which liquefy gelatin and peptonize milk, but in healthy larvae, after being sealed and in the prepupal stage, the enzymes can no longer be demonstrated. That these enzymes are released by the bacterial organism as it sporulates is evidenced by the fact that the amount of enzyme in diseased larvae is in direct proportion to the percentage of spores, and, although in vegetative cultures of *B. larvae* no such proteolytic enzymes are found, they appear concomitantly with sporulation, increasing with further sporulation. Production of these enzymes by dormant spores could not be demonstrated." A list is given of 17 references to the literature.

The genus *Centris* in California (Hymenoptera: Apoidea), P. H. TIMBERLAKE (Calif. Citrus Expt. Sta.). (*Pan-Pacific Ent.*, 16 (1940), No. 3, pp. 138-141).—The species *C. californica* and *C. rhodomelas* are described as new.

Two new species of *Lomachaeta*, with a key to described species (Hymenoptera: Mutillidae, C. E. MICKEL. (Minn. Expt. Sta.). (*Pan-Pacific Ent.*, 16 (1940), No. 3, pp. 127-131).

The identification of the female of the myrmosid subgenus *Myrmosula* (Hymenoptera: Tiphidae), C. E. MICKEL. (Minn. Expt. Sta.). (*Pan-Pacific Ent.*, 16 (1940), No. 3, pp. 132-134).

The oviposition habits of the Eucharidae (Hymenoptera), C. P. CLAUSEN. (U. S. D. A.). (*Jour. Wash. Acad. Sci.*, 30 (1940), No. 12, pp. 504-516, figs. 6).—This contribution relates to the oviposition habits of a family of small wasps that are parasitic upon the mature larvae and the pupae of ants.

Toxicity of selenium-containing plants as a means of control for red spiders, V. H. MORRIS, C. R. NEISWANDER, and J. D. SAYRE. (U. S. D. A. and Ohio Expt. Sta.). (*Plant Physiol.*, 16 (1941), No. 1, pp. 197-202).—Report is made of the results of an investigation aimed at determination of the concentrations of sodium selenate that are not toxic to the plants but which would allow the accumulation in plant tissues of levels of selenium sufficient to be toxic to the common red spider. In this work corn plants were grown by "tank culture" technique in cement tanks 10 ft. long, 2½ ft. wide, and 8 in. deep, with a capacity of 470 l. of nutrient solution. "Under the conditions of these experiments, with additions of 0.5, 1, 2, and 3 p. p. m. of selenium to the nutrient solution in which corn was grown, leaf tissues contained approximately 25, 50, 100, and 150 p. p. m. of selenium, respectively. The leaf tissues containing approximately 25 p. p. m. of selenium were sublethal to red spiders, although the infestations did not cause much injury; at 50 p. p. m. red spider infestations were inhibited, although occasional sluggish individuals were found. At concentrations approximately 100 p. p. m. or above red spiders were unable either to multiply or persist. The

experiment in which a natural infestation of aphids occurred on plants which did not receive selenium but did not occur on plants receiving selenium indicates that aphids are unable to persist on plants which have an available supply of selenium."

***Ornithodoros turicata* in California (Arachnida: Acarina),** T. F. KELLEY. (Univ. Calif.). (*Pan-Pacific Ent.*, 16 (1940), No. 3, pp. 106-107).

Ticks and relapsing fever in the United States, G. EL DAVIS (*Pub. Health Rpts. [U. S.]*, 55 (1940), No. 51, pp. 2347-2351).—Six species of *Ornithodoros*, to which genus the relapsing-fever-transmitting ticks belong, have been reported from the United States (*O. turicata* (Duges), *O. hermsi* Wheeler, *O. parkeri* Cooley, *O. talaje* (Guerin Menneville), *O. coprophilus* McIntosh, and *O. coriaceus* Koch). One or more of these ticks have been reported from 17 States. Tick-borne relapsing fever is present in 11 States. The known vectors are *O. turicata* in Texas and Kansas and *O. hermsi* in California, Colorado, and northern Idaho. *O. parkeri* is the only known species in a large area from which 17 cases have been reported. Spirochetes have been recovered from *O. talaje* collected in Arizona and from *O. parkeri* collected in Wyoming, Montana, and Utah.

ANIMAL PRODUCTION

Farm animals: Their breeding, growth, and inheritance, J. HAMMOND (New York: Longmans, Green & Co.; London: Edward Arnold & Co., 1940, pp. VIII+199, figs. 114).—This book presents the facts on growth, fertility, reproduction, and artificial insemination of farm animals, including poultry.

[Advances in livestock breeding and feeding] (*U. S. Dept. Agr., Sec. Agr. Rpt.*, 1940, pp. 152-155).—Included are conclusions from sire performance studies with beef cattle; a comparison of large-, medium-, and small-type Poland China hogs; studies in the use of waste hair from livestock; the development of a small-type turkey; the use of additional vitamin A for improved feeding; and the grazing efficiency of livestock.

[Experiments in livestock production by the Bureau of Animal Industry]. (Partly coop. Cornell Univ.; Mich., Va., S. C., N. C., Wyo., W. Va., Tex., Ga. Coastal Plain, Cal., Mo., Mont., Calif., S. Dak., Idaho, Miss., and Tenn. Expt. Stas.; et al.). (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt.*, 1940, pp. 2, 3, 4, 10-11, 11-12, 12-18, 20-26, 29-30, 34-35, 36-37, 38-39, 41-42).—The results include progress on the following investigations: Nutritive values of different forages measured with laboratory animals; metabolism studies with silver foxes and minks; vitamin requirements of fur animals; studies on the nutrition and feeding of quail; feeding, breeding, refrigeration, and cooking factors affecting quality of beef, pork, and lamb; feeding of beef and dual-purpose cattle; pasture and range utilization; sheep feeding, grazing, and management; swine feeding; breeding, feeding, cure, management, and utilization of horses and mules; and poultry feeding.

[Investigations on poultry and swine production by the New Jersey Stations] (*New Jersey Stas. Rpt.* 1940, pp. 35-40, 79).—Included are reports on the following investigations: Individual matings with poultry where separate breeding pens are not available, the position of eggs in the clutch as related to shape, rate of growth in early life not related to egg-producing ability of pullets, necessity for fat in the poultry ration, comparison of the effect of differing roofing materials with and without insulation on the temperature of poultry houses, relation of humidity of storage to egg albumen quality, laying house mortality in a line of Leghorns selected for freedom from paralysis, an inexpensive ration for pigeons, and reduced mortality of pigs by the use of posterior pituitary solution during parturition.

[Experiments on nutrition, feeding, and management of livestock by the Cornell Station] (*New York Cornell Sta. Rpt. 1940, pp. 100-102, 105, 107-110, 110-112*).—Reports are given of the results on studies by C. M. McCay, L. A. Maynard, S. A. Asdell, G. H. Ellis, L. L. Barnes, G. Sperling, G. Kimball, J. A. Saxton, P. Johnson, H. R. Guilbert, J. I. Miller, F. B. Morrison, J. P. Willman, L. E. Hanson, M. C. Babcock, K. Mills, E. L. Worthen, R. W. Pease, N. F. Smith, R. B. Hinman, and C. S. Hobbs of the prolongation of productive life of rats; the requirements of calves, goats, and lambs for the B group of vitamins; soybeans and other proteins for growing lambs; a comparison of various protein supplements and supplemental mixtures and the effect of vitamin supplements for growing and fattening pigs; value of incubated eggs and methods of feeding them to growing and fattening pigs; large-scale sheep and wool production in New York; distillers' corn dried grains and brewers' dried grains in comparison with corn for fattening lambs; and a comparison of protein-rich supplements for fattening steers.

[Investigations in livestock production by the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt. 1939-40, pp. 1, 2-6, 53-61, 62, 66-69, 166, figs. 3*).—Brief results are given of the following investigations by R. Wall, V. G. Heller, R. Penquite, C. P. Thompson, W. D. Gallup, A. H. Kuhlman, R. Reder, W. L. Blizzard, B. R. Taylor, H. M. Briggs, J. C. Hillier, and J. A. Beall: Effect of extremely fine grinding of feed; value of fiber in feedstuffs; quick-cured hay; carotene loss in carefully stored baled hay; a blood analysis which revealed vitamin A deficiency; egg oil as a fair source of vitamin A; oats and cottonseed cake in beef cattle-fattening rations; grain and silage winter ration for choice yearling feeder steers; cottonseed cake and corn compared for use with oats for fattening beef calves; barley v. No. 2 corn in calf-fattening ration; the free-choice feeding plan for fattening calves; absence of abortions among ewes on cottonseed meal rations; barley compared with oats for creep-feeding lambs; corn, oats, and barley tested for use in lamb-fattening ration; corn and cottonseed meal and alfalfa and prairie hay compared for fattening lambs; digestibility of cottonseed meal for lambs; no advantage in "flushing" ewes; reduction by molasses of digestibility of other components in rations for lambs; carotene in dry-lot ration for swine cuts cost one-fourth; grinding barley for fattening swine; protein supplements to corn for fattening swine; effect on pigs of protein in sow's ration; best lamb-curing method requires thorough chilling; and grazing work with Angora goats.

[Investigations in livestock production by the South Dakota Station] (Partly coop. U. S. D. A.). (*South Dakota Sta. Rpt. 1940, pp. 17-29, figs. 3*).—The results of investigations are included on the following studies by T. Wright, F. U. Fenn, I. B. Johnson, J. Watson, J. W. Wilson, and M. Myers: Sooner milo v. corn, v. low prussic acid cane, and v. Dakota Amber cane for fattening pigs, rations for pigs in dry lot and on pasture after weaning, good-quality pork production on pasture, creep feeding and purebred bulls for baby beef production, comparison of sorghum grains and corn for fattening steers, feeding gummer ewes and lambs, improved rations for the pregnant ewe, sheep v. hogs on irrigated pastures, and livestock research by the Newell Field Station which involves lamb feeding and early breeding.

[Experiments in livestock production by the Texas Station] (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1939, pp. 15, 44-49, 108-109, 112-113, 145-146, 202-203, 208-209, 217, 218, 221, 235, 236*).—In addition to investigations previously noted there are included brief reports on the following projects, carried on by P. B. Pearson; H. Schmidt, A. C. Mackey, I. B. Boughton, W. T. Hardy, J. H. Jones, R. E. Dickson, J. K. Riggs, J. M. Jones, F. E. Keating, W. H. Black, P. E. Howe, J. J. Bayles, R. A. Hall, E. M. Neal, L. H. Tash, E. K.

Crouch, L. E. Brooks, F. Hale, G. S. Fraps, R. M. Sherwood, F. D. Fuller, J. R. Couch, and L. E. James: Limited and deferred feeding of ground milo heads with cottonseed meal and silage and ground hegarl fodder compared with hegarl silage for fattening steers, replacing part of the corn by dried citrus peel and pulp in cattle fattening rations, green oat grazing and sorghum silage compared for winter feeding of steer calves, mineral and protein deficiencies in range beef cattle rations including calcium and phosphorus supplements, alfalfa v. Sudan hay and ground v. chopped Quadroon heads for fattening lambs, quantitative requirements of vitamin A for pigs, oat pasture for fattening hogs, calcium requirements of pigs on rations with cottonseed meal, concrete wallows for fattening hogs, carotene requirements of hens, protein requirements of chicks, effect of sulfur flour on intestinal cell development of fowls, vitamin D requirements for chicks, corn supplements with oat grazing compared with silage for wintering steer calves, rotation and control grazing of beef cattle, Angora goats, and the role of nicotinic acid in the nutrition of sheep.

[Investigations in livestock production by the Utah Station] (*Utah Sta. Bul.* 294 (1940), pp. 14, 15, 79-82, 88-91, figs. 3).—Included are brief reports on the following investigations: The effect of feeding and breeding on lamb and fleece production, comparison of molasses and grain rations for pork production, breeding and feeding practices for egg and meat production in chickens and turkeys, and studies in bone deformities in growing turkeys.

[Studies on livestock production by the West Virginia Station] (Partly coop. U. S. D. A.). (*West Virginia Sta. Bul.* 298 (1940), pp. 17-18, 19-22).—Investigations by C. V. Wilson, W. H. Black, E. A. Livesay, A. H. VanLandingham, C. E. Weakley, Jr., R. B. Dustman, T. B. Clark, T. D. Runnels, E. T. Wightman, and J. H. Rietz as briefly reported include pastures for finishing yearling steers and heifers, feeding value for beef cows of corn silage with the ears left on, composition of bones from left and right sides of pigs and chickens, proteins for battery chick rations, effect of rations and methods of feeding grain on egg production, and high and low protein rations for White Leghorns.

The accuracy of digestion experiments [trans. title], J. RINGEN (*Meld. Norges Landbr. Høgskole*, 20 (1940), No. 1, pp. 51-81, fig. 1; *Eng. abs.*, pp. 78-80).—Various factors which enter into the accuracy of digestion experiments are discussed, based on the analysis of data acquired from numerous digestion trials. Dry matter determinations made by drying small samples at 100° C. or large samples either at 50°-55° or 65°-70° were of about equal accuracy. The preservation of feces with formalin and holding samples at low temperature prevented loss of nitrogen up to 12 days storage. Chloroform was not a satisfactory preservative. In simple experiments a preliminary period of 7-10 days and an experimental period of 7 days are considered satisfactory. When parallel experiments were conducted with two animals, significant differences in digestion coefficients for the two animals seldom occurred. Greatest differences occurred in the case of crude fiber. When digestion coefficients are determined by difference the importance is stressed of employing a basal ration containing little of the group of nutrients in which the experimental feed is lacking.

The value of grassland products in animal nutrition [trans. title], J. AXELSSON (*K. Lantbr. Akad. Tidskr.*, 79 (1940), No. 5, pp. 399-425, figs. 5; *Eng. abs.*, p. 424).—A comparison of various methods of forage crop preservation indicated dry matter losses of 3-4, 12, 15, and 21 percent in artificial drying, A. I. V. silage, drying on frames, and drying on the ground, respectively. The crude protein, ether extract, and ash contents of the plant material steadily declined as the percentage of crude fiber increased. The coefficient

of digestibility of the organic matter declined about 0.9 unit for each percentage increase in crude fiber content, either in the fresh or preserved material. The feeding value of A. I. V. silage, frame-dried hay, and hay dried on the ground was 85-86, 79-80, and 72-73 percent, respectively, that of the green forage, while the protein value of the conserved products was slightly below these respective levels.

The chemical composition and apparent digestibility of nutrients in crested wheatgrass harvested in three stages of maturity, J. SOTOLA. (Wash. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 4, pp. 303-311, fig. 1).—Study of the crude protein, fiber, nitrogen-free extract, and mineral content of fresh and dried samples of crested wheatgrass cut at different stages of maturity up to 36 in. in height showed the ash, fiber, and nitrogen-free extract to increase as the season progressed, but the percentage of protein in the dry matter decreased. A summary of 30 digestion trials on sheep with fresh and dried samples of the grass cut at 4 and 10 in. in height and dried grass cut in the anther-falling stage showed that the nutrients in the fresh and 4-in. grass clippings were generally better digested than those in the dry and 10-in. clippings, respectively. In the immature stages crested wheatgrass is considered an excellent forage, but it loses much of its nutritive value as it matures.

The apparent digestibility and nutritive value of beardless wheatgrass at three stages of maturity, W. H. BURKITT. (Wash. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 6, pp. 471-479).—According to methods employed by Sotola, noted above, study was made of the crude protein, fat, fiber, nitrogen-free extract, calcium, and phosphorus composition of early-, medium-, and late-cut samples of beardless wheatgrass from practically pure stands. The average apparent digestibility when fed to sheep showed that as the grass matured the digestibility of all the nutrients decreased from over 70 to about 63 percent for the total digestible material and 64 percent for the protein. The nutritive ratio widened from 1:3.39 to 1:10.10 in the late-cut samples.

Dry matter content of crops in relation to hay and silage making, A. E. PERKINS (*Ohio Sta. Bimo. Bul.* 208 (1941), pp. 6-10, figs. 2).—Methods are suggested for producing and testing crops that may be used and stored as silage and hay and methods for bringing them within the optimum dry matter content of from 25 to 40 percent for silage.

The microbiology of silage made by the addition of mineral acids to crops rich in protein.—I, Quantitative chemical and bacteriological data, A. CUNNINGHAM and A. M. SMITH (*Zentbl. Bakt. [etc.]*, 2. Abt., 100 (1939), No. 18-23, pp. 394-408, figs. 4).—This contribution from the College of Agriculture, Edinburgh, describes the experimental ensiling of unchopped ryegrass-clover and bean-pea-vetch mixtures, with the addition of sufficient amounts of mineral acids to reduce the pH of the mixture to approximately 3.5. Acidifying the material to this extent did not completely inhibit the growth of microorganisms, and lactic acid bacteria isolated from the silage were capable of growing in artificial media within a pH range of 3.0-4.0. The predominant fermentative change which occurred in silage of this type was the formation of lactic acid. Fodder crops containing about 20 percent of crude protein were successfully preserved by this treatment.

The microbiology of silage made by the addition of mineral acids to crops rich in protein.—II, The microflora, A. CUNNINGHAM and A. M. SMITH (*Jour. Dairy Res. [London]*, 11 (1940), No. 3, pp. 243-265).—Through application of differential tests, it was found that the microflora of A. I. V. silage consisted mainly of lactic acid bacteria—lactobacilli, streptococci, micrococci, and sarcinae. Both homo- and heterofermentative types of lactobacilli were

represented. A new type of motile homofermentative lactobacilli was isolated and is described. Unidentified homofermentative lactobacilli, micrococci, and sarcinae were also isolated. Streptococci, micrococci, and motile lactobacilli were found mainly in freshly ensiled material, while the majority of lactobacilli and sarcinae were associated with the older samples. Ability to produce carbon dioxide, percentage of lactic acid formed, and lactic-acetic acid ratio were valuable tests for differentiating the organisms.

Kitchen waste for feeding farm stock, J. BEHARRELL (*Nature* [London], 146 (1940), No. 3689, pp. 47-48).—An account of the provisions being taken by Great Britain for saving and drying kitchen waste for poultry and swine feeding. The dried and ground product is a good source of protein and minerals.

Commercial feeding stuffs, 1939-40, E. R. TOBEY (*Maine Sta. Off. Insp.* 176 (1940), pp. 49).—Guaranties and analyses for protein, fat, and fiber of commercial feed samples examined in connection with the feed law in Maine are tabulated. The text of the statute is included.

Inspection of commercial feedstuffs, P. H. SMITH (*Massachusetts Sta. Control Ser. Bul.* 104 (1940), pp. 72).—Guaranties and analyses are reported for 1,628 samples of feedstuffs intended for livestock and poultry consumption. An assay of oil products for units of vitamin D and a discussion of Federal standards for corn and oats are included.

Commercial feeding stuffs, L. S. WALKER, E. F. BOYCE, and H. J. CANNON (*Vermont Sta. Bul.* 468 (1940), pp. 59).—The usual report of the guaranties and analyses of 2,273 samples of feeds officially examined in Vermont during 1940 (*U. S. R.*, 82, p. 805).

The biological value of white fishmeal as determined by growing sheep and rats, D. B. SMUTS and J. S. C. MARAIS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 13 (1939), No. 2, pp. 361-366).—The determined apparent and true digestibility of white fish meal were, respectively, 79 and 97 percent with rats and 63 and 87 percent with sheep. The biological value when fed to rats at a 9-percent level was 90 and for sheep at a 14-percent level 74.

Sterility and depression of growth in relation to age of male rats fed a vitamin E-deficient diet, C. A. CABELL and N. R. ELLIS. (U. S. D. A.). (*North Amer. Vet.*, 31 (1940), No. 9, pp. 539-542, fig. 1).—The critical period for the effects of vitamin E-deficient rations on fertility and growth of ♂ rats started on the deficient ration at 4 weeks of age was found between the fourteenth and sixteenth weeks. When the deficient diet was not started until 8 weeks of age there was evidently sufficient storage of the growth factor to continue growth and fertility for more than 14 weeks, and rats not started on the deficient ration until 12 weeks of age attained normal maximum growth. Return of these animals to a complete stock ration did not result in further increase in weight. The study was conducted with three groups of ♂ rats having their mating ability tested with three fertile ♀s each. The testes were later weighed and examined for motile sperm. The results largely confirmed other growth and fertility findings.

Some factors affecting the quality and composition of meat, J. HAMMOND (*Chem. and Indus.*, 59 (1940), No. 29, pp. 521-525, figs. 4).—The quality, composition, tenderness, color, and flavor of meat are considered to be mainly modified by the age of the animal, plane and quality of nutrition, and part of the carcass from which the cut is taken.

Factors influencing length of gestation and birth weight in cattle, B. KNAPP, JR., W. V. LAMBERT, and W. H. BLACK. (U. S. D. A.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 4, pp. 277-285).—The length of the gestation period of

beef and Milking Shorthorn cattle averaged 280.8 and 281.7 days, respectively, with the birth weights of the calves averaging 69.2 and 79.2 lb., respectively. The results on 164 parturitions of 65 beef Shorthorn cows and 133 parturitions from 68 Milking Shorthorn cows analyzed by variance showed that there is a tendency for individual cows to have a characteristic length of gestation period, and the birth weights of calves produced by any one cow tend to be less variable than those of calves from different cows. Differences in the length of gestation period account for from 25 to 35 percent of the variation in birth weight between sexes. The highest simple correlation of birth weight with other factors was 0.55 with length of the gestation period. This was increased to 0.58 by holding calving sequence and weight of dam constant and to 0.62 for the multiple correlation between all of these factors. Other variables taken into consideration were breed, season of calving, and sex of calves.

Studies on riboflavin and thiamin in the rumen content of cattle, C. H. HUNT, C. H. KICK, E. W. BURBOUGHS, R. M. BETHKE, A. F. SCHALK, and P. GERLAUGH. (Ohio Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 1, pp. 85-92).—Biological assays of the dried rumen contents of steers gave evidence that when a ration of yellow corn, protein supplement, and alfalfa hay was fed riboflavin was synthesized in the rumen. Ingesta removed 4, 12, and 16 hr. after feeding each were found to be richer in riboflavin than the original feed. However, when the ration consisted entirely of alfalfa hay, the rumen content contained less riboflavin than the hay. On either type of ration the ingesta removed 4 hr. after feeding contained more thiamin than the feed, while that removed from 12 to 16 hr. after feeding contained less thiamin than the feed.

On the feeding of a phosphorus supplement to mother-reared calves, prior to weaning, under open range conditions in Bechuanaland, J. H. R. BISSCHOP, A. I. MALAN, H. P. SIEYN, and G. B. LAURENCE (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 13 (1939), No. 2, pp. 321-343, fig. 1).—Results are presented for an experiment comparing the growth rate and blood picture of groups of range calves with and without a supplement of bonemeal up to weaning age. The dams of each group received supplementary bonemeal during the nursing period. The growth rates of the two groups were similar, but the inorganic phosphorus of the blood was subnormal for the unsupplemented group. It is concluded that such a supplement prior to weaning is not necessary if the calves receive the necessary phosphates from weaning onward.

The endogenous nitrogen metabolism of young sheep, with reference to the estimation of the maintenance requirement of sheep, D. B. SMUTS and J. S. C. MARAIS (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 13 (1939), No. 1, pp. 219-225, figs. 2).—Employing essentially the same basal diet as previously used for mature sheep (E. S. R., 82, p. 373), the nitrogen excretion of 4-month-old lambs was determined. Endogenous nitrogen excretion for this age group averaged about 0.061 gm. per kilogram of body weight daily, or 0.01 gm. more than mature sheep. It appeared that the basal metabolism of sheep could be predicted from the endogenous nitrogen. Values obtained in this manner were in close agreement with those reported in the literature. A formula for estimating the maintenance requirement of sheep is presented and its application discussed.

Studies on the metabolism of nicotinic acid in the sheep, P. B. PEARSON, A. H. WINNAR, and H. SCHMIDT. (Tex. Expt. Sta.). (*Jour. Nutr.*, 20 (1940), No. 6, pp. 551-563, figs. 2).—Lambs restricted to a diet deficient in nicotinic acid continued to excrete in the urine essentially as much nicotinic acid as lambs on a well-balanced growing ration, leading to the conclusion that nicotinic acid is synthesized in the alimentary tract or body of sheep. Further, there

was no essential difference in the nicotinic acid level of the blood. The presence of nicotinic acid in the tissues was determined photometrically by methods of Winegar, Pearson, and Schmidt (E. S. R., 83, p. 532).

The effect of breeding on feedlot performance and carcass characteristics of lambs as determined by feeding trials and carcass tests: A comparison of Ryeland \times Rambouillet, Romney \times Rambouillet, Canadian Corriedale, and Rambouillet feeder lambs, K. RASMUSSEN and J. A. WEBB (*Sci. Agr.*, 21 (1940), No. 4, pp. 153-166).—Comparisons of the rate and economy of gain in 1937-38 and 1938-39 of four groups of 40 lambs each of Ryeland \times Rambouillet, Romney \times Rambouillet, grade Rambouillet, and Corriedale breeding showed only slight differences. In the first trial an attempt was made to keep all lambs on about the same amount of grain mixture of barley and oats with alfalfa hay. In the second trial the amount of barley was increased to 3 parts. The average initial weights of the lambs in the groups ranged about 70 lb., with the Corriedales averaging 65 lb., the lightest in weight. The first year's average daily gains were about 0.3 lb., with the largest average gains being made by the Ryeland-cross lambs. In the second year this group made the poorest gains, averaging 0.23 lb. per day as compared with 0.27, 0.28, and 0.27 lb. for the other groups. The lambs were slaughtered, and the carcasses were cut, measured, and graded. A statistical analysis by the methods of variance revealed differences, but in most cases such differences were not statistically significant.

Prenatal growth in the Merino sheep, J. H. L. CLOETE (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 13 (1939), No. 2, pp. 417-558, figs. 46).—This comprehensive report is based on data obtained by post mortem studies on 49 ewes, including 11 nonpregnant individuals and 12, 8, 6, 7, and 5 animals sacrificed after 1, 2, 3, 4, and 5 mo. of pregnancy, respectively. The observations and discussion extended to the genital tract and placenta, fetal membranes and fluids, fetus, mammary glands, and endocrine glands, and in general. An extensive bibliography is included.

The cystine content of Merino wool in relation to its physical attributes, S. D. ROSSOUW and V. BOSMAN (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 13 (1939), No. 1, pp. 237-242).—From cystine determinations on a series of selected Merino wool samples, which differed widely in physical attributes, no significant correlation could be established between the cystine content and textile strength, fiber fineness, crimping, scaliness, percentage extension, or whiteness. It is concluded that the role of cystine in wool production is not an important one.

Gestation period in the pig [trans. title], S. BERGE (*Meld. Norges Landbr. Høgskole.*, 20 (1940), No. 1, pp. 82-119, figs. 3; *Eng. abs.*, pp. 117-118).—The following average gestation periods are reported: Large White 112.7 ± 1.71 days, Norwegian Landrace 114.2 ± 1.52 , and cross-breeds involving these two breeds 114.6 ± 1.67 . A negative correlation was found between the number of pigs per litter and length of the gestation period, the regression coefficient being -0.14 days per pig. Neither age of the sow nor the season of the year were found to have any significant influence on length of the gestation period. The average length of farrowing was 3.5 hr., ranging from 2.68 for the Large White to 4.07 for the Landrace. Only a slight correlation was found between the number of pigs and duration of farrowing.

Studies on the thiamin requirement of young swine, C. VAN ETEN, N. R. ELLIS, and L. L. MADSEN. (U. S. D. A.) (*Jour. Nutr.*, 20 (1940), No. 6, pp. 607-625, pl. 1, fig. 1).—Pigs fed an autoclaved and sodium sulfite-treated diet developed convulsions, locomotor incoordination, paralysis, and other malnutrition symptoms, but thiamin as the sole supplement to the diet permitted

normal growth and alleviation of all deficiency symptoms. The total thiamin chloride hydrochloride requirement for pigs under the conditions was estimated as between 106 and 120 μ g. per 100 gm. of carbohydrate and protein feed consumed. It appeared that the requirement of all species, based on the protein and carbohydrates consumed, was the same. The sulfite-sulfur treatments seemed to require 8 days for complete destruction of thiamin in the early work, but later studies seemed to give complete destruction in 5 days.

A comparison of the nutritive values of raw, pasteurized, and evaporated milks for the dog, H. D. ANDERSON, C. A. ELVEHJEM, and J. E. GONCE, JR. (Wis. Expt. Sta.). (*Jour. Nutr.*, 20 (1940), No. 5, pp. 433-443, pl. 1, figs. 3).—Normal reproduction and good growth in the pups in two litters were maintained on a ration of raw milk supplemented with iron, copper, manganese, and cod-liver oil. When similarly fed evaporated milk instead of raw milk, the pups showed muscular dystrophy and their growth was not as satisfactory. This condition was cured by α -tocopherol. A hemorrhagic condition of the pericardium, lungs, and brain occurring on the evaporated milk diet was not prevented by the vitamin E. Results on the pasteurized milk diet were midway between the raw and evaporated milk rations.

A study of the need for cobalt in dogs on milk diets, D. V. FROST, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Nutr.*, 21 (1941), No. 1, pp. 93-100, figs. 3).—Following earlier trials with rats (E. S. R., 80, p. 276), experiments were conducted with young dogs suffering from nutritional anemia in which milk fortified with iron and copper with and without the addition of cobalt was fed as the sole diet. In many cases the iron and copper supplements alone were adequate for normal hemoglobin building. Adding small amounts of cobalt stimulated hematopoiesis in certain dogs in which the rate of blood formation was unusually low. About half of the dogs showed a cobalt deficiency as evidenced by hematopoietic responses to cobalt at a minimum level of 0.1 mg. per day.

The heat production and blood and urine constituents after administration of l(—) histidine to the dog, A. G. ELATON and J. R. DORR. (La. State Univ.). (*Jour. Nutr.*, 21 (1941), No. 1, pp. 25-34).—On this series of investigations (E. S. R., 81, p. 556), upon intravenous injection of l(—) histidine (free base) into the dog there was a prompt and sustained rise in the urea nitrogen of the blood, but in contrast to the results with glycine, lysine, and arginine there was but little excretion of unchanged histidine in the urine. Histidine was metabolized somewhat faster than arginine. The specific dynamic action of histidine was about 50 percent higher than that of arginine, while the total increase in heat production was about half as great as that produced by an equal weight of glycine. No toxic effects of the histidine were noted.

Economical rations for dogs, C. J. KOEHN. (Aia. Polytech. Inst.). (*Jour. Amer. Vet. Med. Assoc.*, 97 (1940), No. 765, pp. 592-595).—Tests of 13 rations for dogs showed that animal proteins were not necessary for growth and maintenance, but the Auburn ration consisting of yellow corn, wheat shorts, wheat bran, meat scrap and fish meal, alfalfa meal, bonemeal, and salt was unsatisfactory for reproduction without the inclusion of skim milk powder. Three other rations satisfactory for growth and maintenance were included in the comparison.

Deficiencies and fallacies in canine diet, A. F. MORGAN. (Univ. Calif.). (*North Amer. Vet.*, 21 (1940), No. 8, pp. 476-486).—A discussion of the general nutritive requirements of dogs and the specific purpose of using certain foods in dog rations.

[Experiments in poultry nutrition by the Cornell Station] ([*New York Cornell Sta. Rpt. 1940, pp. 163-165*).—Results are reported on investigations by L. C. Norris and G. F. Heuser of the requirements of poultry for components of the vitamin G complex—pantothenic acid and riboflavin—and the role of manganese in the nutrition of poultry and its relation to perosis.

[Investigations with poultry by the Oklahoma Station] (*Oklahoma Sta. Bien. Rpt. 1939-40, pp. 2, 147-152, 156-159*).—Brief results are reported on the following investigations by V. G. Heller, R. Penquite, C. P. Thompson, T. T. Milby, C. A. Roberts, and R. G. Jaap: Kind of feed more important than methods of management used for egg production, use of 5 percent of cottonseed meal does not produce colored yolks, from 16 to 20 percent protein best for laying hens, protein requirement highest during the first 8 weeks, fiber requirement of chicks, oil-soluble green best dye for tracing color deposit in eggs, no profit in capon production on limited range, lights increase fall eggs but not hen's annual production, cottonseed and soybean meals show equal value for poult, bagasse dangerous as poult litter, minimum yard space for turkeys, and lights for poult show no advantages.

[Studies in poultry production by the South Dakota Station] (*South Dakota Sta. Rpt. 1940, pp. 47-54, figs. 2*).—Included are results of the following investigations by W. E. Poley, W. O. Wilson, A. L. Moxon, and R. L. Dolecek: Oats, millet, and wheat good poultry feeds, use of selenium by the chick, successful use of low-grade cereals for egg production, methods of measuring poultry meat quality, sorghums and millets for turkeys, need of vitamin A supplements for turkeys, and soybean meal improves turkey hatchability.

Viability in poultry flocks, D. R. MARBLE. (Pa. Expt. Sta.). (*Amer. Egg and Poultry Rev., 1 (1940), No. 10, pp. 340, 342*).—Adult mortality in the Single-Comb White Leghorn and Barred Plymouth Rock flocks was decreased from 39.8 and 48.7 percent, respectively, in the period 1927-32 to 20.1 and 24.6 percent, respectively, for the period 1933-37. This was accomplished by selection based on family viability and the maintenance of egg production, egg size, body weight, and earliness of mortality.

Effect of corn, wheat, and barley in the diet on the physical and chemical composition of fryers and roasters, W. E. POLEY, A. L. MOXON, W. O. WILSON, and R. L. DOLECEK. (S. Dak. Expt. Sta.). (*Jour. Agr. Res. [U. S.], 61 (1940), No. 3, pp. 161-178, figs. 2*).—Experiments were conducted in 1936 and 1937 on the effects of all-mash rations consisting of 64 percent corn, wheat, or barley with the same basal protein mixture of meat, buttermilk, dried milk, oats, alfalfa leaf meal, and cod-liver oil on the gains, grades, and chemical analyses of the meat of roasters. In the first trial involving White Plymouth Rock cockerels the growing rations were fed from 8 to 31 weeks of age. In the second trial Barred Plymouth Rock cockerels were fed to 24.5 weeks of age, with a 2-week finishing period. The birds in the first trial were fed on millet and rape range, whereas in 1937 comparative feeding was done both on range and duplicated in batteries except that the mash was fed dry in the range tests and as a thin paste to the battery-fed groups. Ten of the most representative birds from each group were graded and measured for the derivation of an index based on breast measurements. Physical separation of the edible portions of the meat and chemical analyses for fat and moisture were carried out. Similar methods were employed in the conduct of tests with fryers in 1937.

The combined results showed that the gains in weight on the barley were made less rapidly than on corn and wheat rations in 1936, but there was no significant difference between the groups in 1937. The corn-fed fryers and roasters showed a consistent tendency to deposit more fat in the light meat,

dark meat, skin and subcutaneous fat, and the abdominal fatty tissue than the other two groups. They graded better than the barley-fed and, to a lesser extent, the wheat-fed lots. Regardless of the cereal used, an increase was found in the percentage of fat in each of the four classes of edible meat in both fryers and roasters finished in the batteries as compared with range-fed birds. In general, the barley-fed groups showed the smallest fat deposits. A tendency was noted toward an inverse relationship between the fat and moisture content of edible meat. Consequently, the range groups generally had a slightly higher moisture content than the battery-fed groups. Corn-fed birds showed a lower moisture content than either barley-fed or wheat-fed birds.

Feathering, growth, feed consumption, and rachitogenesis in chicks as influenced by the kind of grain in the diet. H. L. WILCOKE and J. C. HAMMOND. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 5, pp. 369-380, figs. 2).—In the stimulation of growth and feather development in chicks, single-grain all-mash rations supplemented with dried buttermilk and minerals ranked in the order of oats, barley, wheat, and corn. The inclusion of oat hulls, whole oats, and hulled oats with corn or wheat showed the beneficial effect of the oat products on growth and feathering. However, both oats and barley exerted a slightly depressing effect on the percentage of bone ash in the tibias. The results of the investigation were based on the biweekly weights of 12 lots of 50 chicks and the feather development, bone ash, and bone measurements at 8 and 12 weeks of age. The lowered ash contents of the tibias, as contrasted with those of the birds fed corn and wheat rations, were not considered due to the presence of a rachitogenic factor in oats and barley since all ash values were at a relatively high level. Feed intake on the different rations seemed directly responsible for the rate of growth.

Multiple deficiencies in the modified Goldberger diet as demonstrated with chicks. H. A. WAISMAN and C. A. ELVEHJEM. (Wis. Expt. Sta.). (*Jour. Nutr.*, 20 (1940), No. 6, pp. 519-526, figs. 2).—The effects on growth of day-old chicks are reported resulting from supplements, singly and in groups, of liver extract, thiamin, riboflavin, nicotinic acid, pantothenic acid, vitamin B₆, and the U factor added to the modified Goldberger diet of yellow corn, casein, salts, cottonseed oil, and cod-liver oil. Addition of 100 µg. of thiamin to the basal diet gave a slight improvement in the response during the 5-week test period, but further addition of 200 µg. of riboflavin produced a marked growth response. Although nicotinic acid in small amounts gave some favorable response, above 20-25 mg. per 100 gm. of ration it was definitely toxic. In favorable combinations, B₆, pantothenic acid, and the U factor with riboflavin and thiamin showed favorable results. As the addition of a yeast extract and animal tissues to the diet was favorable, it is concluded that there are other factors than the known members of the B complex concerned in growth of the chicks.

Studies on a dermatitis in chicks distinct from pantothenic acid deficiency. D. M. HEGSTED, J. J. OLSSON, R. C. MILLS, C. A. ELVEHJEM, and E. B. HART. (Wis. Expt. Sta.). (*Jour. Nutr.*, 20 (1940), No. 6, pp. 599-606, fig. 1).—Lesions in chicks from pantothenic acid deficiency are clearly differentiated from the typical dermatitis which develops on purified diets and responds favorably to vitamin H, biotin, and extracts of liver, spleen, kidney, and yeast. The dermatitis produced with an adequate pantothenic acid diet was much more severe.

Effect of choline and other supplements on perosis. T. H. JUKES. (Univ. Calif.). (*Jour. Nutr.*, 20 (1940), No. 5, pp. 445-458, figs. 2).—A. T. Ringrose,

J. H. Martin, and W. M. Insko, Jr.,⁶ found manganese to lower the incidence of perosis in turkeys. In further testing of the effectiveness of certain supplements to a ration of corn meal, skim milk, casein, alfalfa meal, fish oil, and minerals, "the following five modifications of the diet were all found to be completely ineffective in preventing perosis: (1) Substitution of limestone and bonemeal for CaCO_3 and KH_2PO_4 , respectively; (2) replacement of 25 parts of yellow corn meal by wheat bran; (3) addition of 2 parts of wheat bran ash to 100 parts of diet; (4) addition of 0.5 part of mineral mixture (consisting of ZnO , 5; $\text{Al}_2(\text{SO}_4)_3$, 5; $\text{CoCl}_2 \cdot 2\text{H}_2\text{O}$, 1; ferric citrate, 89) to 100 parts of diet; (5) omission of KH_2PO_4 and halving the CaCO_3 content." It was previously noted (E. S. R., 83, p. 813) that choline was the only synthetic product tested to prevent perosis consistently. Soybean meal at a 25-percent level was also effective in this respect. Further tests showed choline in 0.1-percent amounts in the ration to be sufficient for growth, but 33 percent of the birds showed perosis at 15 days. With 0.2 percent of choline in the ration, perosis was entirely prevented in the turkey. Choline gave similar results in perosis prevention in chicks.

A comparison of S-4 Type sun lamps and cod-liver oil as a source of vitamin D for poultry, D. C. KENNARD and V. D. CHAMBERLIN (*Ohio Sta. Bimo. Bul.* 207 (1940), pp. 157-165, fig. 1).—Portions of six groups of from 200 to 250 chicks similarly treated during brooding but receiving radiation from an S-4 Type sun lamp thereafter as contrasted with cod-liver oil gave consistent evidence that the lamp provided adequate vitamin D for growth. Similar rates of growth and mortality were obtained in turkeys supplied vitamin D from a sun porch, sun lamp, or cod-liver oil. The sun lamp also proved favorable in comparison with cod-liver oil as a source of vitamin D for egg production, hatchability of White Leghorn and Rhode Island Red eggs, and growth of chicks after 4 weeks of age. The higher cost of vitamin D from the sun lamp than from the cod-liver oil was more than offset by the returns, but it is pointed out that precautions must be taken to ensure ample vitamin A.

Feeding for hatchability, H. J. DAVIS (*Louisiana Sta. Cir.* 27 (1941), pp. [4]).—A discussion of the nutrients needed for hatchability of eggs, with special consideration of proteins, vitamins, and minerals.

The influence of intensity of egg production upon infertility in the domestic fowl, W. F. LAMOREUX. (N. Y. [Cornell] Expt. Sta.). (*Jour. Agr. Res.* [U. S.], 61 (1940), No. 3, pp. 191-206, figs. 2).—An analysis of the infertility in the eggs of over 1,200 hens showed that during a single week period the highest percentage of infertility, 31.2, was in the eggs of hens laying at the rate of one egg per week, whereas the least infertility, 11.8 percent, was found among hens averaging seven eggs per week. Similar results were obtained in eggs laid over a 6-week period. With larger clutches, a smaller percentage of infertile eggs was found than in smaller clutches. The first two and last two eggs of clutches did not show consistent differences in fertility, disproving the theory that oestrogen present in the Graafian follicles at the beginning of a clutch was related to fertilizability of the ova. The duration of fertility following artificial insemination was not prolonged by the daily injection of 100 rat units of Progynon-B. Hens which laid at a rate of less than 55 percent laid fertile eggs for a shorter period than heavier layers. Evidence pointed toward less frequent copulation of low-producers, and the frequency was influenced only slightly, if at all, by 12 daily injections of from 100 to 1,000 rat units of Progynon-B.

⁶ Poultry Sci., 18 (1939), No. 5, pp. 409, 410.

Changes in ovomucin during egg storage, R. M. CONRAD and H. M. SCOTT. (Kans. Expt. Sta.). (*Amer. Egg and Poultry Rev.*, 1 (1940), No. 9, pp. 306, 308).—No change in the microscopic structure in the gel of eggs stored for 8 days at 35° C. could be detected, although the percentage of mucin decreased from 2.11 to 1.83. The pH increased from 8.22 to 9.45, but if the eggs were sealed before storage the pH was reduced to 7.35. The changes in quality associated with storage are attributed to supposed changes in the elasticity of the mucin fibers of eggs from 13 pullets histologically studied in the boiled egg white.

The Khaki-Campbell egg-type duck, W. C. THOMPSON (*New Jersey Stas. Bul.* 685 (1940), pp. 15, figs. 5).—This is a brief account of the characteristics and egg production of the Khaki-Campbell duck as observed in England and the United States.

DAIRY FARMING—DAIRYING

[Progress in dairy research] (*U. S. Dept. Agr., Sec. Agr. Rpt.*, 1940, pp. 128-130).—Brief reports are presented on progress in dairy herd improvement through testing and the use of proved sires, cheese quality improvement, and the utilization of whey and other dairy byproducts.

[Investigations with dairy cattle and dairy products in New Jersey] (*New Jersey Stas. Rpt.* 1940, pp. 21-26, 28-31, fig. 1).—Studies, for which results are briefly reported, include returns secured from the application of fertilizer and lime to pastures, including a comparison of various systems of fertilization; the influence of mid-June fertilization of timothy on its composition and nutritive value; the loss of nutrients in molasses-grass silage and the fate of molasses during the ensiling process; roughage as a sole ration for yearling dairy heifers; feeding methods to insure good flavor and color in winter milk; silo pressures developed by grass silage; the protection of silo walls against the corrosive action of silage juices; grass silage harvesting equipment; breeding for high color in milk; the relationship of endocrine activity to the decline in milk production after the peak is reached; the influence of various metals on milk flavor; the value of oat flour as an antioxidant in dairy products; chemical methods for determining the vitamin D content of milk and standards of comparison for use in assaying vitamin D in milk; the value of ultraviolet lamps for sterilizing dairy equipment; and milk marketing investigations.

[Investigations with dairy cattle and dairy products by the Cornell Station] (*[New York] Cornell Sta. Rpt.* 1940, pp. 98, 99, 102, 103, 112-115, 119-125).—Brief progress reports (*E. S. R.*, 82, p. 810) are presented for the following investigations, by L. A. Maynard, C. M. McCay, J. K. Loosli, G. H. Ellis, M. J. Babcock, P. Johnson, K. E. Gardner, E. Pagé, W. L. Nelson, E. S. Savage, E. S. Harrison, J. S. Taylor, and L. K. Lu: The influence of fat intake and of fat components in the ration upon milk and fat secretion; factors in cod-liver oil which lower the percentage of fat in milk; the role of yeast vitamins in growth and lactation, and the value of yeast for dairy cattle; chemical changes occurring in phosphoric acid silage and the effects of such silage on acid-base relationships in the animal body; losses and changes accompanying the ensiling of legumes and nonlegumes with various amounts of phosphoric acid, and the feeding value of phosphoric acid silage and molasses silage; and a comparison of mangel beets v. dried beet pulp on a total-digestible-nutrient-replacement basis.

From investigations with dairy products, by P. F. Sharp, V. N. Krukovsky, D. B. Hand, E. S. Guthrie, H. Doob, A. W. Willmann, I. C. Gunsalus, B. L. Herrington, R. F. Holland, O. Rahn, G. Knaysi, C. N. Stark, M. L. Speck, W. A.

Seleen, W. R. Straughn, J. M. Sherman, C. F. Niven, Jr., K. L. Smiley, P. A. Smith, H. M. Hodge, F. J. Rudert, C. Lamanna, A. J. Wood, and D. J. O'Kane, results are briefly noted on the inactivation of milk lipase by dissolved oxygen; the effect of properties of the fat and of the fat-globule surface on lipolytic activity of milk; a method for determining oxygen in milk; the amount of flavoprotein on the surface of milk-fat globules; the browning of dried milk and dried whey; crystalline modifications in lactose; the reduction of dehydroascorbic acid by *Bacterium coli*; lactose-nuclei formation in ice cream; the taxonomy, physiology, and morphology of coliform and related bacteria, streptococci, lactobacilli, and aerobic spore-forming bacilli; and the riboflavin production of staphylococci.

[Investigations with dairy cattle and dairy products in Oklahoma] (*Oklahoma Sta. Bien. Rpt. 1939-40, pp. 70-76, fig. 1*).—Studies for which results are reported include work by A. H. Kuhlman, W. D. Gallup, E. L. Fouts, and W. A. Krienke on the amount of carotene required for normal reproduction in dairy cattle, the relation of color to carotene content of hay, prairie hay v. alfalfa for milking cows, the value of cottonseed meal as a source of carbohydrates in the dairy ration, prevention of rickets in calves by feeding sun-cured hay and by direct exposure to sunlight, methods of reducing deterioration in cream on the farm, a comparison of cream neutralizing agents, the influence of repeated washings and of various intensities of working on butter quality, a rapid incubation test for predicting the keeping quality of butter, and the influence of breed of cattle on the yield and quality of cottage cheese.

[Experiments with dairy cattle and dairy products in South Dakota] (*South Dakota Sta. Rpt. 1940, pp. 30-41, figs. 2*).—Investigations, for which results are reported by T. M. Olson, G. C. Wallis, and D. H. Jacobsen, include the comparative returns secured from sweetclover, alfalfa, and Sudan grass pastures; types and amounts of gases in the rumen of bloated cows; corn silage v. legume-sorghum silage for dairy cows; the effect of the fineness of grinding grain on its digestibility and value for milk production; the effect of green and dried peppergrass on milk flavor; the vitamin D requirements of dairy cows; the influence of the roughage ration on the vitamin D potency of milk, and the relative vitamin D potency in the milk of the different breeds; methods of reducing weedy cream flavor in butter; methods of holding cream for churning in the dairy plant; and the influence of storage temperature on butter flavor.

[Dairy investigations in Texas] (*Texas Sta. Rpt. 1939, pp. 109-112, 148*).—Brief progress reports (E. S. R., 82, p. 529) are presented for the following studies, made by O. C. Copeland, A. L. Darnell, G. S. Fraps, C. N. Shepardson, E. B. Reynolds, P. R. Johnson, F. E. Hanson, and T. R. Freeman: The quantitative requirements of vitamin A for dairy cattle, dried citrus peel and pulp in the ration of lactating dairy cows, the value of manure and fertilizers for improving Bermuda grass pasture, the effect of adding bonemeal and lime to the rations of growing helpers and milking cows, methods of manufacture and other factors affecting the quality of butter, the effect of various temperature exposures on the quality of southern short-cure Cheddar cheese, and variations in the normal composition of milk produced in the State.

[Dairying investigations in Utah] (*Utah Sta. Bul. 294 (1940), pp. 74-75, 85-86*).—Results are briefly reported on man-, horse-, and machine-hours required in the production of 100 lb. of digestible nutrients and the butterfat production per acre for various feed crops, and the utilization of frozen fruits in the manufacture of ice cream.

[Dairy investigations in West Virginia] (*West Virginia Sta. Bul. 298 (1940), pp. 23-25, figs. 3*).—Results of studies by H. O. Henderson, R. A. Acker-

man, G. G. Pohlman, G. A. Bowling, A. H. VanLandingham, E. N. Moore, C. E. Weakley, Jr., W. C. Brown, and R. B. Dustman are briefly noted on gains in dairy heifers on bluegrass, alfalfa, and lespedeza pastures; pasture improvement through the use of fertilizers; the use of alfalfa as the sole source of protein in dairy rations; the influence of rations on the incidence of mastitis; and the value of high-quality hay in the ration in preventing oxidized flavor development in milk.

Yield, chemical composition, and feeding value for milk production of alfalfa hay cut at three stages of maturity, J. R. DAWSON, D. V. KOPLAND, and R. R. GRAVES (*U. S. Dept. Agr., Tech. Bul. 739 (1940), pp. 52, figs. 6*).—Experiments were conducted at the U. S. Dairy Field Station, Huntley, Mont., for 3 yr., in which irrigated alfalfa cut at the initial-bloom, half-bloom, and full-bloom stages was compared. The stage of cutting had little effect on the stand as indicated by plant counts and vigor of the plants in the spring following the third year of the experiment. Average per acre yields of field-cured hay were 8,938, 8,888, and 6,940 lb.; average crude protein content of the hay was 18.24, 18.29, and 15.71 percent; the digestion coefficient of the crude protein was 77.7, 77.1, and 75.4 percent; and the average cost per pound of total digestible nutrient was 70, 77, and 91 ct. for the initial-bloom, half-bloom, and full-bloom alfalfa, respectively. First cuttings of all stages were inferior to later cuttings. The crude fiber content was lower for the initial- and half-bloom stages. When the alfalfa hay was fed as the sole ration to milking cows the average consumption per lactation period was 14,390, 14,442, and 14,060 lb. of hay, the average milk production was 11,099, 9,763, and 8,981 lb., and the average butterfat production 404, 345, and 331 lb. on the initial-, half-, and full-bloom stages, respectively. These values indicated that initial-bloom hay was somewhat more nutritious than hay cut at a later stage. The average production of 4-percent fat-corrected milk per acre was 6,330 lb. for the initial-bloom, 5,254 for the half-bloom, and 3,970 lb. for the full-bloom plots.

Effect of ensiling upon the composition of forage crops, M. W. TAYLOR, C. B. BENDER, and W. C. RUSSELL (*New Jersey Stat. Bul. 683 (1940), pp. 19*).—Complete feed analyses and carotene determinations were made on over 100 samples each of green crops and the corresponding silages, including a wide range of crops ensiled with and without preservatives. Most of the materials showed losses of from 10 to 15 percent in total dry matter during ensiling. The loss of protein was usually higher than that of dry matter and was most marked in samples high in protein. The use of larger amounts of preservative tended to reduce protein losses. Carotene values in the silages were highly variable, but in general good quality silage showed a high degree of preservation of carotene. Grasses and legumes ensiled with molasses or phosphoric acid contained from two to three times as much carotene as corn silage. The loss of carotene did not necessarily parallel losses of other constituents but seemed dependent on moisture content and degree of packing. Fat, phosphorus, and ash were other constituents showing great variability.

Rumen synthesis of the vitamin B complex, M. I. WEGNER, A. N. BOOTH, C. A. ELVEHJEM, and E. B. HART. (*Wis. Expt. Sta.*). (*Soc. Expt. Biol. and Med. Procs.*, 45 (1940), No. 3, pp. 769-771).—A heifer calf with rumen fistula was fed a synthetic diet of washed casein, urea, corn molasses, cornstarch, bleached wood pulp, cod-liver oil, and salt mixture which was low in all members of the vitamin B complex. Assay of the rumen contents indicated the synthesis of significant amounts of thiamin, riboflavin, nicotinic acid, pantothenic acid, pyridoxin, and biotin. When thiamin was added to the basal diet and the rumen content removed and assayed 6 hr. later, a destruction of the thiamin was contraindicated, while there was an apparent stimulation of the synthesis of the other factors.

Age as a factor influencing breeding efficiency in a dairy herd, G. A. BOWLING, D. N. PUTNAM, and R. H. ROSS. (W. Va. Expt. Sta.). (*Jour. Dairy Sci.*, 23 (1940), No. 12, pp. 1171-1176, figs. 6).—A summary of the breeding records of 706 cows and 43 bulls by conceptions and age showed that the number of services required for first conceptions of cows by bulls of all ages averaged 2.79, as compared with about 1.8 for the second to the sixth conception. The breeding of heifers to bulls under 4 yr. of age gave somewhat better results than when older bulls were used. Bulls over 6 yr. of age began to be less certain breeders.

Secretion of radio-strontium in milk of two cows following intravenous administration, L. A. ERF and C. PECHER. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 3, pp. 762-764, fig. 1).—Each of two lactating Holstein cows received intravenous injections of 50 cc. of an isotonic solution containing radioactive strontium lactate which emitted 11.2 microcuries of beta radiation per cubic centimeter. Following injection, milk was collected hourly for 6 hr. and twice daily for 4 additional days. Over this period of 4.25 days 7.88 and 11 percent of the radio-strontium were secreted in the milk.

A preliminary report on the effect of metals on fresh milk, A. VALENZUELA (*Philippine Jour. Anim. Indus.*, 7 (1940), No. 5, pp. 453-457, fig. 1).—The effects of immersing strips of copper or brass in fresh milk from the cow or carabao on the methylene blue reduction time and the nutritive value of the milk are reported. Fresh milks thus treated decolorized methylene blue in from 7 to 8 hr., whereas untreated fresh milk from the same source reduced the dye in 5 hr. The growth-promoting properties of the untreated milk and the copper- or brass-treated milk were similar when each was fed as the sole diet to young albino rats over a period of 8 weeks. Metallic milk became flat, tasteless, and somewhat metallic in flavor, losing the natural flavor of fresh milk.

Subclinical staphylococcus mastitis in herds free from streptococcus mastitis, and its effect upon milk composition, P. M. F. SHATTOCK and E. C. V. MATTICK (*Jour. Dairy Res. [London]*, 11 (1940), No. 3, pp. 311-315).—In a herd of 428 cows free from streptococcus mastitis, 21 percent of the individuals were found to harbor staphylococcus infection in their udders, although no clinical cases of mastitis were observed. Data are presented to indicate that changes in the chemical composition of the milk accompany staphylococcus infection. Crystal violet blood agar, used in detecting *Streptococcus agalactiae* infection, failed to indicate the presence of staphylococci.

The effect of variations in the fat percentage and in the reaction (pH) of milk media on the heat resistance of certain milk bacteria, A. A. NICHOLS (*Jour. Dairy Res. [London]*, 11 (1940), No. 3, pp. 274-291, figs. 2).—The heat resistance of about 40 strains of aerobic sporeformers isolated from canned milk products and three strains of *B[acillus] subtilis* which caused bitterness and thinning in canned cream was determined with skim milk, whole milk, and 23 percent cream as substrates. Most of these strains showed extremely high heat resistance, and the variation in the butterfat content of the media had no pronounced effect on the resistance. In parallel experiments with certain nonspore-forming organisms of lower thermal death point, increasing the butterfat content of the substrate failed to increase heat resistance. The results of varying the pH of the medium from about 5.95 to 7.25 were inconsistent, but it appeared that increases or decreases on either side of pH 6.6 to 6.8 may tend to decrease the resistance of the spores to heat.

Possible errors in the phosphatase test resulting from bacterial growth in milk, H. W. LEAHY, L. A. SANDHOLZER, and M. R. WOODSIDE (*Jour. Milk Technol.*, 3 (1940), No. 4, pp. 183-188).—Twenty-eight cultures of bacteria, repre-

sents 8 different genera, were tested for their ability to produce phosphatase when grown in sterile milk. The phosphatase test of Kay and Graham was applied, using both the Folin-Ciocalteu reagent and the Gibbs phenol reagent. One strain of *Staphylococcus*, 5 of *Aerobacter*, and 3 of *Klebsiella* were found to produce a true phosphatase reaction. Seven additional strains produced a false phosphatase reaction to the Folin-Ciocalteu reagent, which gave as strong color reactions with oxygenated purine derivatives as with phenol. It is concluded that phosphatase tests on milk having standard plate counts higher than 2,000,000 per cubic centimeter or direct microscopic counts higher than 8,000,000 per cubic centimeter should be interpreted with caution.

Symposium on tryptone-glucose-extract-milk agar, H. E. LIND (*Jour. Milk Technol.*, 3 (1940), No. 4, pp. 208-214).—The survey results reported indicate a rather general favorable acceptance on the part of public health departments of the new standard medium in milk control. A discussion by D. Dixon follows (pp. 210-214).

Time required for destruction of bacteria at different temperatures of pasteurization, M. J. PRUEHA and W. J. COBBERT. (Univ. Ill.). (*Jour. Milk Technol.*, 3 (1940), No. 5, pp. 269-273, fig. 1).—Fresh raw milk samples of low initial bacterial content were inoculated with a pure culture of a selected, heat-tolerant strain of *Escherichia coli*. Sub-samples were exposed to 10 pasteurization temperatures, ranging from 143° to 162° F., with a range of holding periods at each temperature. To attain the equivalent in killing property of 143° for 30 min., it required 150° for 8 min. 30 sec., 156° for 2 min. 24 sec., 160° for 47 sec., or 162° for 21 sec. The greatest intensities of cooked flavor were induced at the low-temperature, long-holding-time levels, while cream volume was most adversely affected at the highest temperatures. Complete inactivations of phosphatase in milk (readings under 0.8 p. p. m. of phenol) occurred at 143° for 30 min., 150° for 5 min., 156° for 25 sec., or instantaneous exposure at 160° or above.

High temperature-short-time pasteurization of milk, F. C. BUTION. (N. J. Expt. Stas.). (*Jour. Milk Technol.*, 3 (1940), No. 4, pp. 198-203).—A review, with 21 references.

The effect of the time and temperature of pasteurization upon some of the properties and constituents of milk, R. F. HOLLAND and A. C. DAHLBERG (*New York State Sta. Tech. Bul.* 254 (1940), pp. 55, figs. 6).—In this more detailed report (*El. S. R.*, 84, p. 664), it is further noted that within a temperature range from 140° to 175° F. a semilogarithmic relationship between the time and temperature of pasteurization was found in the case of cream volume, the inactivation of phosphatase, and the destruction of *Escherichia coli*. The rennet coagulation time of milk was slightly increased by pasteurization over the entire temperature range. No significant changes in the relative amounts of CaHPO_4 and $\text{Ca}_3(\text{PO}_4)_2$, or of casein and heat coagulable protein were found within time and temperature ranges useful for commercial pasteurization. Residual nitrogen was increased by heating in most instances. A pasteurization temperature of 170° appeared very promising on the basis of all criteria applied.

Browning of autoclaved milk: Chemical factors involved, J. P. KASS and L. S. PALMER. (Univ. Minn.). (*Indus. and Engin. Chem.*, 32 (1940), No. 10, pp. 1560-1566, figs. 5).—Chemical changes which characterize and accompany the caramelization of lactose were studied by following the development of color in relation to the reducing, optical, and acid-forming properties of lactose solutions heated in the presence of various buffers at extended ranges of pH, concentration, and time. The trend of the caramelization reaction was the same for all buffers used, and the coloration formed was a logarithmic function of the optically inactivated lactose. The parallelism between the reaction of caramel prepared by heat alone or heat in the presence of buffers and the

brown coloration present in heated milk led to the conclusion that the origin and behavior of this coloration may be satisfactorily accounted for on the basis of the caramelization of lactose by the casein and the adsorption of the lactocaramel by the colloidal caseinates.

Supplementary notes on the deaeration of milk, P. F. SHARP, D. B. HAND, and E. S. GUTHRIE. (Cornell Univ.). (*Jour. Milk Technol.*, 3 (1940), No. 4, pp. 228, 229).—A supplement to a previous report (E. S. R., 84, p. 521).

Nutritional aspects of milk, II, W. E. KRAUSS. (Ohio Expt. Sta.). (*Jour. Milk Technol.*, 3 (1940), No. 4 pp. 205-207).—A general discussion, with particular reference to the effect of rations on the vitamin content of milk.

Measuring the sanitary quality of market cream, W. J. CAULFIELD, F. E. NELSON, and W. H. MARTIN. (Kans. Expt. Sta.). (*Jour. Milk Technol.*, 3 (1940), No. 5, pp. 245-254).—The study reported covered the examination of 63 samples of cream collected from commercial plants and numerous laboratory samples processed under controlled conditions. Tests applied included the New York City field and the Gilcreas and Davis phosphatase tests, bacterial counts (both by the standard plate and direct microscopic methods), numbers of *Escherichia-Aerobacter* organisms, pH and titratable acidity. The enzyme phosphatase proved to be more heat-resistant than selected heat-resistant strains of *Escherichia-Aerobacter*. Pasteurization of cream at 143.5° F. for 30 min. failed to insure negative phosphatase tests, but 150° for 30 min. resulted in 100 percent negative phosphatase tests. A high percentage of commercial samples were phosphatase negative and had bacterial plate counts of under 60,000 per cubic centimeter. The bacterial counts of coffee cream averaged nearly double that of whipping creams. As compared with the milk from which cream was separated, cream samples showed an increase in number of phosphatase-positive samples and in plate count and a marked increase in numbers of coliform organisms. No single test proved adequate in evaluating the sanitary properties of cream, each test having its own particular significance.

Application of the resazurin test to pasteurized cream, H. JENKINS (*Milk Dealer*, 30 (1940), No. 3, pp. 58, 60).—Data secured on the relation of resazurin reduction time to the bacterial content of pasteurized cream gave evidence that a reduction time of from 6 to 7 hr. insured that cream would meet regulations requiring the maximum standard plate count of 40,000 bacteria per cubic centimeter. The average count of cream in this class was 17,000 per cubic centimeter, whereas in creams having a reduction time of less than 3 hr. 100 percent of the samples exceeded 40,000 per cubic centimeter.

The quality of butter made from vacuum-pasteurized and vat-pasteurized lots of the same creams, N. E. FABRICIUS and E. W. BIRD (*Iowa Sta. Res. Bul.* 284 (1940), pp. 149-172, figs. 3).—Duplicate batches of cream representing good-, slightly defective-, and poor-quality creams were vat pasteurized at 155° F. for 30 min. and vacuum pasteurized in a steam-injection system at 190°-204° (vacuum 11 to 4.5 in.), respectively. Churning and working procedures employed with the two lots of the same cream were as nearly identical as possible. The scores of butters from the vacuum-pasteurized cream of the various grades were consistently higher than those of butter from the duplicate batches of cream pasteurized by the vat method. This applied to fresh butter and to butter held for 6 weeks at 38° or 6 mo. at 0°. Vacuum pasteurization proved desirable even for highest grade cream, and improved both body and flavor scores at all seasons of the year. There was little difference in the bacterial count of cream pasteurized by the two methods, and both were equally effective in destroying yeasts and molds. On some occasions the vacuum-pasteurized cream was phosphatase positive.

A bacterial discoloration of print butter, A. H. WHITE (*Sci. Agr.*, 20 (1940), No. 11, pp. 638-645, pl. 1).—Studies of an unusual discoloration developing on the surface of mildly salted butter resulted in the isolation of the causal organism, for which the name *Pseudomonas nigrifaciens* is suggested. The morphology and cultural characteristics of the organism are described. This defect of butter was reproduced by inoculating the cream used for churning or butter wash water with a pure culture of the organism providing about 0.5 percent salt was added to the butter. Unsalted butter or that containing over 1 percent salt failed to support growth of the organism.

Studies on the chemistry of Cheddar cheesemaking.—VII, The measurement of the acidity of cheese and the relation of acidity to grading score, R. M. DOLBY, F. H. McDOWALL, and W. RIDDER (*Jour. Dairy Res. [London]*, 11 (1940), No. 3, pp. 305-310, figs. 5).—Continuing this series (E. S. R., 77, p. 536), data are graphically presented on the relationship of titratable acidity to pH in cheese and also the relation of acidity at 14 days to the grade of the cheese at 3 mo. The pH of cheese at 14 days appeared to be the most useful means of measuring the extent of acid development in the cheese. Such values showed a rather close agreement with the grade of mature cheese. Cheeses having a pH value close to 4.9 at 14 days gave the highest grade at maturity.

The influence of "mastitis" upon the yield and quality of Cheddar cheese, C. K. JOHNS, T. J. HICKS, and C. A. GIBSON (*Jour. Dairy Res. [London]*, 11 (1940), No. 3, pp. 298-304).—This contribution from the Canadian Department of Agriculture describes tests of the cheese yield from normal milk, milk infected with *Streptococcus agalactiae*, and abnormal milk free from *S. agalactiae* infection. In all cases the normal milk gave higher cheese yields than the other two classes of milk, apparently due to the lower casein and solids-not-fat contents of the mastitis milk. In only one case was the quality of cheese from the mastitis milks inferior to those made from normal milk.

Cheese in consumer-size packages, H. L. WILSON. (U. S. D. A.). (*All. Butter and Cheese Jour.*, 32 (1941), No. 1, pp. 64-66).—A general discussion.

Whey solids in candy, B. H. WEBB and C. F. HUFNAGEL (U. S. D. A.). (*Food Res.*, 5 (1940), No. 2, pp. 185-195).—The experiments reported demonstrated that excellent candy containing up to 40 percent whey solids could be made, the whey partially replacing sugar, skim milk, and corn sirup. Adjustments in formulas were necessary to allow for the effect of whey upon sucrose inversion and for the development of proper body through control of the physical state of the lactose. Sweetened, condensed, Cheddar-cheese or Swiss-cheese whey (E. S. R., 80, p. 100) proved the most desirable form for this purpose. Whey condensed without sugar was satisfactory, but its perishable nature was a serious disadvantage. Soluble, spray-dried, sweet-whey powder was also satisfactory. Condensed, acid, cottage cheese whey required neutralization and sometimes produced candy of inferior quality. Directions for preparing various types of whey candy are included.

Protein stability of ice cream mixes and its effect on certain properties, C. D. DAHLE and P. W. RIVERS. (Pa. State Col.). (*Ice Cream Trade Jour.*, 36 (1940), No. 10, pp. 58, 60, 114-121).—To determine the influence of reducing the acidity of ice cream mixes on protein stability, experimental mixes made from fresh ingredients and also those containing frozen cream received additions of sodium hydroxide, calcium hydroxide, or magnesium oxide to give a desired range of acidity in each case. Protein stability in the mix and in the melted ice cream as measured both by the acid number and the alcohol number was increased by the addition of these alkalies. The sodium ion was more effective in reducing acidity and had a greater stabilizing effect than the calcium or magnesium ions. The use of alkalies was particularly effective in

restoring the whipping ability of mixes containing frozen cream, although this condition was not always associated with increased viscosity of the mix. The addition of alkali after processing had about the same influence on protein stability as when added before processing. The method of freezing had little influence on protein stability. High acid mixes were not improved materially from the flavor standpoint when the acidity was reduced.

The relation of acidity, solids per gallon, and different sources of serum solids to the physical and chemical properties of high serum solids ice cream, W. H. E. REID, C. W. DECKER, and W. S. ARBUCKLE (*Missouri Sta. Res. Bul.* 323 (1940) pp. 48, figs. 18).—Four series of experimental ice creams were studied with reference to the chemical and physical properties of the mix and quality of the resulting ice cream. In series 1 and 2, containing 13.5 and 15 percent serum solids, respectively, mixes were standardized to acidities of 0.08, 0.12, 0.18, and 0.24 percent, respectively. Corresponding pH values were 7.65, 7.5, 6.9, and 6.8 in series 1, and 8.5, 7.65, 6.9, and 6.6 in series 2, indicating that serum solids content definitely influences pH values. Variable acidity had little effect on surface tension of the mix, but a marked effect on viscosity. Consumer preference indicated that those samples of neutral or slightly alkaline pH were most desirable. In series 3, in which total solids content per gallon ranged from 1.65 to 2.06 lb., ice cream containing 1.77 lb. was preferred by a majority of the consumers, while that containing 1.9 lb. ranked second. Macroscopic examination showed that ice cream having from 0.12 to 0.18 percent acidity and a total solids weight per gallon of 1.77 gave the most desirable texture, while microscopic examination indicated that that having an acidity of 0.12 percent and total solids weight of 1.77 to 1.9 lb. per gallon contained smaller and more uniform shaped ice crystals. Reducing the total solids per gallon and increasing overrun tended to increase stability of the ice cream due to the development of a minute air-cell structure. Ice cream in which the major proportion of the serum solids was made up with mineralized dry milk solids showed greater resistance to melting and gave a smaller average weight per disher but more dishes per gallon than when the major proportion of serum solids was derived from plain dry milk solids. A serving temperature of 8° F. was preferred by a majority of the consumers. The largest average weight per disher occurred at 12° and the smallest at 4°.

Dextrose and corn sirup for frozen desserts, A. C. DAHLBERG and E. S. I'ENCZEK (*New York State Sta. Bul.* 696 (1940), pp. 36, figs. 4).—Three different types of corn sweeteners, namely, enzyme-converted corn sirup, corn sirup solids from regular corn sirup, and hydrated dextrose were compared with sucrose. These products possessed relative sweetness of 67, 49, and 89, respectively, as compared with a value of 100 for sucrose. The freezing point depression in the water solutions increased in the following order—corn sirup solids, sucrose, the enzyme-converted corn sirup, and dextrose. The viscosity, acidity, and fat clumping in ice cream mixes were only slightly affected by the addition of corn sweeteners. Best results were secured by replacing 25 percent of the sucrose with amounts of the corn sweeteners necessary to give the same sweetening equivalent. Such additions of corn sweeteners resulted in slight but definite improvement in body and texture of ice cream but tended to lower its melting resistance. The corn sweeteners markedly improved the body and texture of sherbets and ices and delayed sucrose crystallization.

The application of wetter water to dairy and milk plant use, F. M. SCALES and M. KEMP (*Jour. Milk Technol.*, 3 (1940), No. 4, pp. 221-227).—Experiments comparing the action of a number of wetting agents in wash waters are described. Data are also presented on the detergent qualities of common alkali cleaners, which as a group were deficient in wetting and penetrating qualities.

It is concluded that the use of suitable wetting agents will yield better results with less time and labor than are generally attained with ordinary plant cleaning materials.

VETERINARY MEDICINE

Veterinary bacteriology, I. A. MERCHANT (Ames: Iowa State Col. Press, 1940, pp. VIII+628, figs. 135).—This textbook is presented in four parts, as follows: General biology of micro-organisms (pp. 1-123); infection, resistance, and immunity (pp. 129-213); classification and characteristics of pathogenic bacteria (pp. 215-535); and the filtrable viruses (pp. 537-604).

[Work in animal pathology and parasitology by the Bureau of Animal Industry] (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1940, pp. 1, 2, 3, 5-9, 36, 43, 44, 45-61, 62-90*).—The work of the year reported (*E. S. R., 82, p. 817*) relates to Bang's disease; tuberculosis and its eradication; bovine mastitis; fowl leucosis (fowl paralysis); avian encephalomyelitis; vesicular stomatitis; hog cholera and its control; disinfectants; tuberculin and other diagnostic tests; eradication of scabies; inspection and quarantine of imported animals and products; infectious equine encephalomyelitis; periodic ophthalmia; swine erysipelas; anaplasmosis; infectious anemia; miscellaneous diseases; stock-poisoning plants; tick eradication; parasites of horses, ruminants, swine, and other animals and of poultry and treatment for their removal; and virus-serum control.

[Control of diseases of livestock] (*U. S. Dept. Agr., Sec. Agr. Rpt., 1940, pp. 155-158*).—Reference is made to the continued exclusion of foreign livestock diseases, the work of bovine tuberculosis eradication, suppression of Bang's disease, tick eradication 99 percent completed, and the trichinosis situation.

[Work in animal pathology by the New Jersey Stations] (*New Jersey Sta. Rpt. 1940, pp. 26-27, 40, 41-42, 42-43*).—The work of the year (*E. S. R., 83, p. 677*) reported upon relates to the protection of the udders of dairy heifers from Bang's disease, initiation of a program of herd hygiene, a study of infectious laryngotracheitis, use of the agglutination test for the detection of paratyphoid of pigeons, and equine encephalomyelitis in pheasants.

[Work in parasitology by the Cornell Station] (*[New York] Cornell Sta. Rpt. 1940, pp. 106-107, 110*).—The work of the year reported upon includes the control of strongyles in horses, by G. W. Salisbury, D. W. Baker, and J. W. Britton; and a comparison of tetrachloroethylene and the combined copper sulfate-nicotine sulfate solution as treatments for the control of the worm parasites of the digestive tract of sheep and lambs, by J. P. Willman and Baker.

[Work with livestock diseases and parasites by the South Dakota Station] (*South Dakota Sta. Rpt. 1940, pp. 42-46*).—The work of the year (*E. S. R., 82, p. 678*) reported upon includes studies on the selenium poisoning of livestock and oat hay poisoning, both by A. L. Moxon and O. E. Olson; tests with immunizing agents for hemorrhagic septicemia, by J. B. Taylor; and chenopodium for the eradication of worms in lambs, by F. J. LeBlanc, T. Wright, and J. Watson.

[Work in animal pathology and parasitology by the Texas Station] (*Texas Sta. Rpt. 1939, pp. 12-14, 37-38, 238-242*).—The work of the year (*E. S. R., 82, p. 531*) briefly reported upon includes infectious bovine abortion by H. Schmidt, R. D. Turk, O. C. Copeland, and C. N. Shepardson; anaplasmosis in cattle, by P. L. Piercy; disease resistance of sheep to stomach worms (*Haemonchus contortus*) by B. L. Warwick, Schmidt, Turk, and R. O. Berry; and at the Sonora Substation, stomach worms in sheep and goats, hard yellow livers of sheep and cattle, feeding trials of suspected plants, infectious enterotoxemia of lambs, limberleg of sheep, tests with screwworm larvae, and pregnancy

disease, all by I. B. Boughton and W. T. Hardy; and the calcium and phosphorus requirements in the Edwards Plateau by Boughton.

[Work in animal pathology by the Utah Station, 1939-40] (*Utah Sta. Bul.* 294 (1940), pp. 86-88, fig. 1).—The work (E. S. R., 80, p. 392) of the biennium referred to includes post-parturient hemoglobinemia in cows, control of mastitis in a dairy herd, and the relationship of soft-curd milk to subclinical mastitis.

[Reports of the veterinary director general for the years ended March 31, 1937, 1938, 1939, and 1940] (*Canada Dept. Agr., Rpts. Vet. Dir. Gen.,* 1937, pp. 46; 1938, pp. 45; 1939, pp. 41; 1940, pp. 45).—The annual reports (E. S. R., 78, p. 99) of work with infectious diseases for 1937 and 1938 are by G. Hilton et al. and for 1939 and 1940 by A. E. Cameron et al.

[Contributions on animal pathology and parasitology] (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.,* 14 (1940), No. 1-2, pp. 9-119, 433-488, figs. 47).—Contributions presented (E. S. R., 84, p. 523) include the following: Eperythrozoonosis in Cattle, by W. O. Neitz (pp. 9-28); Swine Fever [Hog Cholera] in South Africa, by G. de Kock, E. M. Robinson, and J. J. G. Keppel (pp. 31-93); South African Helminths—VII, Miscellaneous Helminths, Chiefly Cestodes, by R. J. Ortlepp (pp. 97-110) (E. S. R., 82, p. 817); Treatment Against Lungworms (*Dictyocaulus filaria*) in Sheep (pp. 111-114) and *Marshallagia marshalli* (Ransom, 1907) Orloff, 1933 and a New Species of this Genus [*M. brevispiculum*] From Sheep in South Africa (pp. 115-119), both by H. O. Münnig; The *Senecio* Alkaloids—II, Hydrogenation, Hydrolysis, and Structural Results of Isatidine, by H. L. de Waal (pp. 433-447) (E. S. R., 82, p. 817); Conjunctivitis of the Domestic Fowl and an Associated *Rickettsia*-like Organism in the Conjunctival Epithelium, by J. D. W. A. Coles (pp. 469-478); and Anatomical Studies No. 63—An Abnormal Bovine Heart, by J. H. L. Cloete and H. P. Steyn (pp. 481-488).

Buffered blood cultures, C. I. NELSON. (N. Dak. Expt. Sta.). (*Jour. Infect. Diseases,* 66 (1940), No. 2, pp. 113-116, fig. 1).—Description is given of a type of medium for use in culturing refractory organisms in circulating blood. The medium depends upon the added blood for its nutrients and avoids inhibiting influences usually found in culture media for this purpose. The time required for growth is much shorter than that required for other blood culture media.

Studies on the hemorrhagic sweet clover disease.—I, The preparation of hemorrhagic concentrates, H. A. CAMPBELL, W. L. ROBERTS, W. K. SMITH, and K. P. LINK. (Wis. Expt. Sta.). (*Jour. Biol. Chem.,* 136 (1940), No. 1, pp. 47-55).—Report is made of an extraction and fractionation scheme that has been developed for the concentration of the hemorrhagic substance in spoiled sweetclover hay. "When 0.6 gm. of this concentrate is fed to standardized susceptible rabbits, the plasma prothrombin is reduced to 10 percent of the normal in 40 to 48 hr. This is equivalent to a 200-fold concentration (minimum) of the hemorrhagic agent. The chemical nature of the hemorrhagic agent present in the concentrates is not known at this stage. However, it can be stated that the concentrate is essentially free from the following classes of substances: Fats, waxes, certain pigments, sugars, glycosides, water-soluble polysaccharides, water-soluble acids, amines, alkaloids, water-soluble proteins, and water-soluble decomposition products of chlorophyll."

White snakeroot poisoning in Arkansas, E. L. NIELSEN and D. F. EVELETH. (Ark. Expt. Sta.). (*Vet. Med.,* 36 (1941), No. 3, pp. 136-137, fig. 1).—Record is made of the instance of human milk-poisoning ("milk sickness") near Harrison and Jasper, Ark., during the last 40 yr. White snakeroot (*Thapsotrium*

urticaefolium), grazed upon by cows, is said to be abundant throughout this region.

Culture media for *Brucella*. G. P. KERBY and R. M. CALDER (*Jour. Bact.*, 40 (1940), No. 5, pp. 637-643).—Only two of the numerous substances studied for their possible value as growth-promoting factors for *Brucella* were found worthy of further investigation. A milk medium described may prove useful if variation due to undefined differences in lots of milk can be controlled. Sodium caseinate medium seems to show promise in the isolation of certain strains of *Brucella*, but it probably cannot be relied upon to improve tryptose broth in all instances.

Capsule formation by members of the *Brucella* group. W. A. MICKIL (*Jour. Infect. Diseases*, 66 (1940), No. 3, pp. 271-277, figs. 5).—Of 27 strains of *Brucella* examined microscopically, culturally, and serologically for evidence of capsule formation, 5 produced demonstrable capsules either directly or after mouse passage and 5 others showed serological and cultural characteristics similar to the encapsulated strains but did not produce demonstrable capsules. The encapsulated strains were not agglutinable in ordinary antiserum but were highly agglutinable in serums prepared against homologous organisms, and vice versa. The encapsulated strains served as poor antigens *in vivo*. Encapsulated organisms can be denuded by cultivation in beef extract broth. These stripped variants are culturally indistinguishable from the encapsulated and nonencapsulated forms. They act as better antigens *in vivo* than encapsulated organisms and produce agglutinins for the encapsulated forms to high titer. Opsonic studies showed that injection of encapsulated organisms into rabbits was followed by low opsonocytophagic index increase, while the injection of nonencapsulated organisms produced a large increase in this index for homologous organisms.

Studies relating to *Brucella abortus* infection.—I, On the occurrence of the organism in the blood stream. II, On the occurrence of the organism in serous swellings or hygromata on cattle, F. A. HUMPHREYS and T. MOURI (*Canad. Jour. Compar. Med. and Vet Sci.*, 5 (1941), No. 1, pp. 5-20, figs. 4).—This contribution is presented in two parts.

In work reported in the first part (pp. 5-11) heart blood specimens from 3 groups of infected guinea pigs comprising 157 animals were cultured, and blood from 35 of these was passaged to other guinea pigs. *B. abortus* was isolated in pure culture from 21 guinea pigs, and its presence was indicated in 4 others by animal inoculation. Twelve cultures grew only under increased carbon dioxide tension, 5 grew only in ordinary atmosphere, and 4 grew in both. When 116 specimens of bovine blood collected from 40 different animals, both naturally and artificially infected, were cultured, not a single specimen yielded a culture of *B. abortus*.

In work reported in the second part (pp. 11-20) the contents of 45 serous swellings (hygromata) on 36 positive and 6 negative animals were examined. The presence of *B. abortus* was indicated by (1) successful isolation in pure culture in 15 of the 25 specimens cultured; (2) guinea pig inoculation, and the resulting serological reactions, in 25 of the swellings; and (3) both methods combined, in 27 of the swellings. In 1 animal whose blood serum was negative and whose hygromatous fluid did not agglutinate *B. abortus* above 1:50, the presence of *B. abortus* was indicated by guinea pig inoculation. In 2 animals in which both the blood serum and hygromatous fluid were negative, the presence of *B. abortus* in the hygromatous fluid was proven by direct isolation of the organism. Evidence of *B. abortus* infection was educed in approximately 93 percent of the animals that developed hygromata.

Progress in the control of contagious abortion and mastitis in Illinois. R. GRAHAM and J. A. HENDERSON. (Univ. Ill.). (In *Dairy Manufactures Con-*

ference Manual, Department of Dairy Husbandry, University of Illinois, Urbana, Illinois, November 13-17, 1939. Urbana: Univ. Ill., 1939, pp. 9-17).

Agglutinability of mastitis streptococci. W. N. PLASTRIDGE, L. F. BANFIELD, and L. F. WILLIAMS. ([Conn.] Storrs Expt. Sta.). (*Jour. Infect. Diseases*, 66 (1940), No. 3, pp. 202-211).—The importance of accurate identification of *Streptococcus agalactiae*, *S. dysgalactiae*, and *S. uberis*, representing mastitis streptococci groups I, II, and III, respectively, as classified by Minett and Little, led to the work here reported. Its significance is indicated by the fact that *S. agalactiae* infection can be eradicated from herds by detection, segregation, and elimination of infected animals. When this is accomplished herds can be maintained free from infection, while a similar program has not been effective in attempting elimination of *S. dysgalactiae* and *S. uberis*.

"All ingredients, especially the kind of peptone, used in preparing nutrient broth were found to have a pronounced influence on the agglutination properties of bovine udder streptococci. Of the mediums studied, the one of the following composition proved to be best suited for the routine production of antigens for use in the slide agglutination test: Beef infusion plus 2 percent Difco-Proteose peptone, 0.4 percent dextrose, and 1 percent K₂HPO₄, and adjusted to pH 7.4. The presence of 1 percent normal sterile ox serum in the medium selected made possible the preparation of usable antigens from most spontaneously agglutinable strains but tended to make inagglutinable the cultures which were specially agglutinable when grown in the serum-free medium. Reduction of the dextrose content of the medium to 0.1 percent made possible the preparation of usable antigens from a majority of inagglutinable strains. Cells of a mucoid-rough variant which were unsatisfactory antigens because they occurred in stringy viscid masses were made specifically agglutinable by shaking in the presence of tenth-normal sodium hydroxide. The tendency of cultures to be specifically agglutinable, spontaneously agglutinable, or inagglutinable was found to vary in different herds. *S. dysgalactiae* cultures showed a marked tendency toward spontaneous agglutination which was more difficult to overcome than that of either *S. agalactiae* or *S. uberis*. A procedure which made possible the preparation of specifically agglutinable antigens from 99.2 percent of 240 strains of *S. agalactiae* is described."

The work supplements that previously noted (E. S. R., 81, p. 421).

Streptococcus acidominimus, R. R. SMITH and J. M. SHEEMAN. (Univ. Calif. and Cornell Univ.). (*Jour. Infect. Diseases*, 65 (1939), No. 3, pp. 301-305).—It is shown that *S. acidominimus*, described by Ayers and Mudge from the udder of cows (E. S. R., 47, p. 682), commonly occurs in significant numbers in the vagina of cows. From a rather extensive physiological study of cultures isolated from this source, it is concluded that these organisms may be clearly differentiated from the other known species of the streptococci. Serologically, *S. acidominimus* does not belong to any of the established streptococcal groups.

The effects of environmental conditions on the accessibility of third stage trichostrongyle larvae to grazing animals, W. P. ROGERS (*Parasitology*, 32 (1940), No. 2, pp. 208-225, figs. 12).—In studies conducted in Western Australia it was found that the larvae of *Trichostrongylus*, *Haemonchus*, *Ostertagia*, and *Chabertia* migrated upwards on the blades of sedge (*Kyllinga* sp.) and of ryegrass (*Lolium perenne*) in greatest numbers when subjected to a light of an intensity about 62 footcandles. Moisture on the grass favored larval migration, but more than 0.12 cc. of water per square centimeter of soil surface retarded movement, and more than 0.2 cc. per square centimeter tended to prevent larval migration up the grass. Of the genera examined *Ostertagia* spp. were most favored by the presence of moisture on the grass; *H. contortus* was most hin-

dered by its presence. Increasing quantities of moisture in the soil up to 85-percent saturation assisted larvae to move on to the grass. Above this value larval migration was retarded. *Ostertagia* spp. were best able, and *H. contortus* least able, to migrate from wet soil. *H. contortus* was found to migrate on relatively dry grass at a faster rate than *Trichostrongylus* spp. and *Ostertagia* spp. In the temperature range examined larvae were found to move up the grass in largest numbers at 5° and 45° C. *H. contortus* was the most active species at higher temperatures.

Yeast as an adjunct to the anthelmintic treatment of advanced cases of trichostrongylosis in calves, D. W. BAKER (*Cornell Vet.*, 31 (1941), No. 1, pp. 13-16).—Emaciated calves heavily parasitized by trichostrongyles, representing the genera *Trichostrongylus*, *Ostertagia*, *Cooperia*, and *Nematodirus*, were reconditioned and the reconditioning maintained by administration of suspensions of dried yeast. Successful treatment consisted of the use of tetrachloroethylene and mineral oil immediately after oral swabbing with a 5 percent copper sulfate solution.

The standardisation of johnin.—I, The suitability of the guinea-pig as a test animal, R. M. GLOVER (*Vet. Jour.*, 97 (1941), No. 1, pp. 3-15, figs. 2).

The use of phenothiazine in veterinary parasitology, W. E. SWALES (*Canad. Jour. Compar. Med. and Vet. Sci.*, 4 (1940), No. 12, pp. 333-341).—This review of the subject is presented with a list of 31 references to the literature.

The materia medica of phenothiazine, J. W. BRITTON (*Cornell Vet.*, 31 (1941), No. 1, pp. 1-12).—This summary of the chemistry, pharmacology, methods of administration, action on parasites affecting domestic animals, and the toxicology of phenothiazine is presented with a bibliography of 50 titles.

Some experiences with phenothiazine, A. FOGGIE (*Vet. Rec.*, 52 (1940), No. 35, pp. 783-785).—The administration of from 40 to 60 gm. of phenothiazine to calves suffering from parasitic gastritis gave very encouraging results. Dosing sheep suffering from stomach worm disease with from 13 to 20 gm. of phenothiazine was much less satisfactory.

An examination of the urine of sheep dosed with phenothiazine, M. LIPSON (*Austral. Jour. Expt. Biol. and Med. Sci.*, 18 (1940), No. 3, pp. 269-272, fig. 1).—In the work conducted about 10 percent of the original dose of phenothiazine administered to sheep was recovered in the urine passed within 26 hr. following. "The red color developing in the urine of sheep dosed with phenothiazine is due in part to thionol, but does not consist entirely of this compound as the results of previous workers on other animals have indicated. Phenothiazone is also formed from phenothiazine, and the present study has shown that the color developed in sheep's urine is due as much to phenothiazone as to thionol. The two oxidation products can be conveniently separated by chromatographic adsorption. The three compounds occur in combination with other constituents of the urine. The thionol and phenothiazone are excreted mainly in the form of leuco bases which are oxidized to the parent dyestuffs on allowing the urine to stand in the air."

A preliminary note on the efficiency of phenothiazine against some poultry helminths, F. H. S. ROBERTS (*Vet. Rec.*, 52 (1940), No. 47, pp. 819, 820).—The administration of phenothiazine in the commercial form, Thiox, at dose rates of 0.4 gm. per pound body weight, 1 gm. per pound body weight in a single dose, and 1 gm. per pound body weight divided into three equal portions and administered on 3 successive days, was ineffective against *Ochlospirura hamulosa*, *Baillietina tetrayona*, and *Hynnenelepis carioeca*. The dose rate of 1 gm. per pound body weight in a single dose gave a moderate effi-

ciency against *Ascaridia galli* (56.2 percent) and indicates that better results may be secured with a higher dose rate.

The diseases of dairy cattle, P. S. WATTS (*Jour. Dairy Res.* [London], 11 (1940), No. 3, pp. 316-350).—Reviews are given of the progress of work with mastitis, Bang's disease, and bovine tuberculosis, together with a list of 320 references to the literature.

A modified Whiteside test for the detection of chronic bovine mastitis, J. M. MURPHY and J. J. HANSON. (*N. J. Expt. Stas.*). (*Cornell Vet.*, 31 (1941), No. 1, pp. 47-55, fig. 1).—A description is given of a modification of the Whiteside test for mastitis. It is performed by mixing five drops of foremilk and one drop of N NaOH solution on a flat glass plate, using a dull green blotter as a background. After mixing for 20 sec. with a glass rod the test is examined by reflected light for the presence of a precipitate. The amount and character of the precipitate can be graded. The modified Whiteside test was found to parallel closely the leucocyte count in ability to detect the presence of udder infection. It embodies simplicity of operation and ability to show in a rough quantitative manner the degree of irritation existing in the mammary gland and should be of great value in field use as a simple, accurate, presumptive test for the presence of chronic bovine mastitis.

Hemolytic streptococci associated with the bovine udder, F. R. SMITH and H. S. CAMERON. (*Univ. Calif.*). (*Cornell Vet.*, 31 (1941), No. 1, pp. 24-29).—A study was made of four groups of hemolytic streptococci isolated from the bovine udder. One appears to be associated with well-recognized species in the enterococcus group. The other three did not show characteristics usually associated with recognized species, and no attempt was made to name them.

Trichomonads in the heart blood of an aborted fetus, D. E. MADSEN. (*Utah Expt. Sta.*). (*Cornell Vet.*, 31 (1941), No. 1, pp. 18-20).—The etiological significance of the author's findings led to the presentation of this report of the detection of trichomonads (*Trichomonas fetus*) in the mucus of the mouth, stomach contents, heart blood, and lungs of aborted bovine fetuses. None of the trichomonads were observed in the liver. They were most numerous and active in the heart blood and stomach, those in the lungs being sluggish and scattered. The findings are considered to add support to the possibility of congenital transmission, although in this instance the possibility of invasion of the blood stream from the digestive tract after death cannot be discounted.

The parasitic hazards encountered in southern and western raised calves and lambs in New York, D. W. BAKER (*Cornell Vet.*, 31 (1941), No. 1, pp. 42-44).

A report on the prevalence of helminth parasites in sheep in southwestern Virginia, together with observations on certain anthelmintics employed, W. L. THRELKELD. (*Va. Expt. Sta.*). (*Va. Acad. Sci. Proc.*, 1940, pp. 209-210).—Report is made of parasites found on autopsy of 28 sheep raised in southwestern Virginia. Nine of the 15 parasites observed were present in more than 10 of the animals, namely, *Cooperia curticei* 20, *Oesophagostomum columbianum* 18, *Haemonchus contortus* 17, *Nematodirus* sp. 17, *Moniezia* sp. 16, *Ostortagia circumcincta* 13, *Trichostrongylus vitrinus* 11, *Bunostomum trigonocephalum* 11, and *Trichuris ovis* 11. The use of from 2.5 to 3 cc. of a 10 percent copper sulfate solution for stimulating closure of the oesophageal valve for directing anthelmintics in capsules not larger than 20 mm. X 16 mm. to the abomasum was 68.4 percent effective, and has a percentage value of 46.2 advantage over capsules administered without preliminary treatment with the copper sulfate. Anthelmintics employed to date are copper sulfate, copper tartrate, copper arsenate, nemural, and phenothiazine. Comparative results based on autopsy of treated and untreated animals are reported.

Enteritis in sheep and swine: Reaction to Johnin, D. F. EVELETH and J. L. REINECCIUS. (Ark. Expt. Sta. and U. S. D. A.). (*Vet. Med.*, 35 (1940), No. 9, p. 500, fig. 1).—Typical lesions of Johne's disease and the presence of acidfast organisms thought to be *Mycobacterium paratuberculosis* are reported as found in cattle, sheep, and swine examined in northwest Arkansas.

Studies on genetic resistance in swine to Brucella infection.—II, A bacteriological examination of resistant stock, H. W. CAMERON, P. W. GREGORY, and E. H. HUGHES. (Univ. Calif.). (*Cornell Vet.*, 31 (1941), No. 1, pp. 21-24).—Further studies (E. S. R., 83, p. 542) led to the conclusion that the genetic constitution of the resistant stock in the investigations was an ability to resist infection by *Brucella suis* rather than an inability to produce agglutinin against it.

On an Entamoeba occurring in English goats, C. A. HOARE (*Parasitology*, 32 (1940), No. 2, pp. 226-237, figs. 16).—Description is given of an apparently nonpathogenic amoeba, found in the feces of 10 of 14 English goats in three different localities, that is morphologically identical with *E. deblickei* of the pig.

The toxicity of *Sartwellia flaveriae* to goats, F. P. MATHEWS. (Tex. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 4, pp. 287-292, pl. 1, fig. 1).—In investigations commenced in Pecos County, Tex., in 1933 the force feeding of the range plant *S. flaveriae* to goats was found to cause loss of appetite and with the continued feeding of the plant regardless of this symptom fatal results were produced as early as the twenty-second day. Extensive necrosis of the liver was associated with such cases. Long feeding periods were made possible by discontinuing the force feeding of the plant whenever inappetence appeared but resuming it when the appetite returned to normal. There appeared to be little or no permanent ill effects from the first feeding period conducted in this manner. However, two or more feeding periods of this nature produced pulmonary edema, hydrothorax, and death in four out of five goats which were thus fed. There was slight necrosis of the liver cells in such cases and a deposit of yellow pigment which was soluble in alcohol.

Further studies on moldy corn poisoning (leucoencephalomalacia) in horses, H. E. BIRSTEY, L. H. SCHWABE, and C. H. REDDY. (Iowa State Col. et al.). (*Vet. Med.*, 35 (1940), No. 11, pp. 636-639, figs. 7).—This account supplements the earlier report (E. S. R., 76, p. 694) in which the pathology of fatal cases of moldy corn poisoning was described and the condition was differentiated from equine encephalomyelitis. Many species of organisms were present in the moldy corn. There was no clue as to the pathogen involved in the disease. Of these species, *Trichoderma lignorum* Harz was grown on sterilized corn and fed without ill effects. One horse, fed the corn on which a green mold growth appeared, died 40 days after the experiment was started. It was also determined that severe microscopic changes are associated with nonfatal cases in which no gross liquefaction necrosis exists. Another horse, killed after consuming the same material for 110 days, showed marked microscopic changes in the central nervous system. No gross liquefaction was found in the brain, but histologic studies revealed small foci of coagulation, perivascular edema, hemorrhages, evidence of thrombosis, and degenerative changes in the blood vessel walls. Similar variations in individual susceptibility were found in a previous feeding experiment. Three horses, fed corn showing a gray type of mold growth, were killed after a feeding period of 110 days. During this period the animals rolled frequently, gave indications of increased irritability, and at times appeared depressed. One horse presented slight incoordination. At autopsy no gross liquefaction was found in the brains. The microscopic changes consisted of perivascular edema, retrograde changes in the blood vessel walls, minute foci of coagulation, and

hemorrhages in the brain. The spinal cords were softened and presented some similar changes.

Studies on the bionomics and control of the bursate nematodes of horses and sheep.—VIII, Comparisons of the lethal effects of some chemicals containing sulphur on the free-living stages of sclerostomes, I. W. PARNELL. (*Canad. Jour. Res.*, 18 (1940), No. 11, Sect. D, pp. 371-394, figs. 11).—In continuation of this series (*E. S. R.*, 82, p. 819), tests of 14 common chemicals containing sulfur on free-living stages of sclerostomes are reported. It was found that "potassium xanthogenate in weak solution will sterilize about 160 times its weight of fresh feces; in a strong solution, less than a quarter of the weight. Carbon disulfide will sterilize only about 32 times its weight under the conditions imposed by this technic. In solutions of medium strength the sulfates of zinc will sterilize 32 times and those of iron (ferrous), copper, and manganese, 13 times their weight. Lesser quantities, however, might be effective in practice because the larvae from cultures so treated die comparatively rapidly after reaching the third stage. Dry ferric sulfate will sterilize 20 times its weight. Sodium sulfide, sodium sulfite, and sodium sulfate are all so ineffective that only when applied dry or as strong solutions are they lethal. They sterilized from 8 to 5 times their weight. Magnesium sulfate will sterilize only 4 times and zinc sulfide twice its weight of fresh feces. Ferrous sulfide and flowers of sulfur do not appear to have any lethal value, but the latter may, by controlling antagonistic factors, increase the chances of survival of the larvae."

Effect of feeding repeated small doses of selenium as sodium selenite to equines, W. T. MILLER and K. T. WILLIAMS. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 5, pp. 353-368, figs. 8).—In the experimental work reported, selenium (the cause of alkali disease) in the form of sodium selenite when fed in small repeated doses over long periods of time was responsible for the death of all four animals used but failed to induce outstanding symptoms typical of chronic poisoning in any of them. Two horses received 24 parts of selenium per million of feed and a mule 17.3 parts for a period of 6 mo. At the end of this time the dose of selenium was doubled, and 2 weeks later the mule died. The horses were continued at this level for 9 mo., after which the dose was again doubled. Both horses died within 2½ mo. after the dosage was increased, or within 17½ mo. after the experiment began. A third horse fed a diet containing 115 parts of selenium per million parts of feed survived but 5 weeks. All the animals exhibited loosening of the hair in the mane and tail, slight changes in the horn of the hoofs, listlessness, and extreme emaciation in spite of a fairly good appetite. Shortly before death there was a sharp increase in the selenium content of the blood, a condition which suggested a break-down in elimination of selenium from the body. At autopsy the lesions observed in the heart, liver, spleen, and kidneys resembled those described in field cases.

Blood glucose, plasma inorganic phosphorus, plasma calcium, hematocrit, and bone ash values of normal minks (*Mustela vison*) and foxes (*Vulpes fulva*), S. E. SMITH. (U. S. D. A., Cornell Univ., et al.). (*Cornell Vet.*, 31 (1941), No. 1, pp. 56-62).

The composition of vesical calculi of fur animals, S. E. SMITH and A. Z. HODSON. (U. S. D. A., Cornell Univ., et al.). (*Cornell Vet.*, 31 (1941), No. 1, pp. 30-34, figs. 2).

The cytology of fox encephalitis and the effects of centrifugation upon the intranuclear inclusions, A. M. LUCAS. (Iowa Expt. Sta. et al.). (*Amer. Jour. Pathol.*, 16 (1940), No. 6, pp. 739-760, pl. 1).—This contribution is presented with a list of 45 references to the literature.

The importance of pathological study in poultry diseases, E. L. STUBBS (*Poultry Sci.*, 20 (1941), No. 1, pp. 66-68).

A disease of chickens apparently identical with nutritional encephalomalacia, F. D. ASPLIN (*Vet. Jour.*, 96 (1940), No. 11-12, pp. 440-452, pl. 1).

Listeria (*Listerella*) infection in the fowl, R. K. COLE (Cornell Univ.). (*Poultry Sci.*, 20 (1941), No. 1, pp. 28-32, figs. 2).—Report is made of 8 cases of *Listeria* infection in pullets of the New York (Cornell) Station flock observed in the fall of 1939. Massive necrotic foci of the myocardium appear to be rather reliable pathognomic lesions. The causative organism produced a marked relative monocytosis upon intraperitoneal injection of young chickens. In a footnote the author reports that no less than 18 additional cases of *Listeria* infection occurred between July 1 and August 20, 1940, among the young stock (4 or 5 mo. old) being raised on the same range.

A nervous disorder of young chickens, J. R. BEACH (Univ. Calif.). (*Nutrit. News*, 18 (1941), No. 10, p. 13, fig. 1).—A brief account is given of a type of nervous disorder that has appeared in some 50 flocks of growing chicks in California which does not conform to any of the known diseases of this nature of either infectious or dietary origin.

Fowl paralysis: Transmission of infective agent to young chickens, R. E. GLOVER (*Vet. Jour.*, 96 (1940), No. 11-12, pp. 427-437).—An infective agent that was isolated from the tissues of a turkey with typical lesions of neurolymphomatosis produced lymphocytic and necrotic lesions in the liver and heart of very young chicks of the Brown Leghorn and Plymouth Rock strains. The infection was passed through 16 generations without demonstrable modification. Transmission was secured by the intraperitoneal, subcutaneous, intravenous, intracerebral, and intranasal routes. Attempts to produce an immunity to the agent in chicks were unsuccessful, and no neutralizing antibodies were demonstrated. These failures may have been due to inability to control quantitative factors.

Studies on *Plasmodium lophurae*, a malarial parasite in fowls.—I, Biological characteristics, L. A. TERZIAN (*Amer. Jour. Hyg.*, 33 (1941), No. 1, Sect. C, pp. 1-22, figs. 2).—Report is made of the first of studies undertaken to determine (1) the characteristics of infections in chicks with *P. lophurae*, (2) some of the biological characteristics of the organism, (3) the pathological and blood changes taking place in infected chicks, and (4) the effects of various experimental factors in the course of the infection in chicks inoculated under laboratory conditions.

The occurrence of multiple types of paratyphoid bacilli in infections of fowls, with special reference to two new *Salmonella* species, P. R. EDWARDS and D. W. BRUNER (Ky. Expt. Sta.). (*Jour. Infect. Diseases*, 66 (1940), No. 3, pp. 218-221).—A description is given of 15 outbreaks of paratyphoid infection in fowls in each of which more than one *Salmonella* type was found. In 2 instances two paratyphoid species were recognized in cultures from the internal organs of the same bird. In 1 case three *Salmonella* species were found in a culture taken from the liver of a single poult. Two new serological types of *Salmonella* are described. One of these, a member of the *S. paratyphi* B-S. typhimurium group, is designated as *S. saint paul*. Its antigenic formula is I IV V: eh: 1, 2, 3. The second type is named *S. wickfield*. It is a member of the *S. newport* group, and its antigens are represented by the formula VI VIII: iv: 1, 2, 3.

Further observations on an organism in turkeys whose blood serums agglutinate *Salmonella pullorum*, E. P. JOHNSON and M. POLLARD (Va. Expt. Sta.). (*Jour. Infect. Diseases*, 66 (1940), No. 3, pp. 193-197).—A further report (*Ill. S. R.*, 76, p. 109) is made of a Gram-positive organism isolated from turkeys, whose cultural and morphological characteristics resemble those of lactobacilli.

Rabbits and turkeys inoculated with this organism developed agglutinins for *S. pullorum*. A similar agglutinin response occurred in chickens inoculated with *Lactobacillus casei*. The exact chemical nature of the antigen which is responsible for this phenomenon has not been ascertained. Observations indicated that the pH of the antigen exerts considerable influence on the accuracy of the agglutination test. At pH 7.6, which approximates the pH of the host serum, the antigen is regarded as having a more accurate suspension stability than at pH 6.2 or pH 8.2. The name *L. meleagridis* is suggested for the organism. The significance of nonspecific antigenicities as complicating factors in the program for the eradication of pullorum disease of chickens and turkeys is emphasized.

Egg propagation of turkey pox virus, F. R. BEAUDETTE and C. B. HUDSON. (N. J. Expt. Stas.). (*Poultry Sci.*, 20 (1941), No. 1, pp. 79-82).—Report is made of the successful egg propagation of turkey pox virus, it appearing to be the first time that this type has been cultivated in eggs. A description of the technique employed is included. The authors failed to observe any difference in the macroscopical appearance of the serosa lesions provoked in the egg by this virus and that of fowl origin. Of the 10 eggs inoculated in the third and fourth generations, not an embryo died, despite extensive lesions. Cross-immunity tests made in a limited attempt to study the immunological relationships of canary, pigeon, turkey, and fowl viruses are reported, the details being given in table form.

"The strain of turkey pox studied seems to differ from that observed by Brunett [E. S. R., 71, p. 836] in that it produces in chickens a lesion of longer duration than that produced by fowl pox. This difference, however, may be quantitative rather than qualitative. The strain differs from that studied by Brandy and Dunlap [E. S. R., 80, p. 688] in that it produces a typical scab of considerable thickness. Whether the reaction will become decreasingly less severe with serial passage in chickens remains to be determined. If the lesions observed in egg passages are an indication, however, the reverse is to be expected. Compared with our strain of fowl pox the turkey strain produces far more severe local and systemic reactions and also provokes a high percentage of secondary head lesions. Immunologically, canary virus seems to protect chickens against pigeon virus but not against turkey virus. It also appears to produce very slight immunity against fowl virus. The pigeon virus protects chickens against canary virus and also confers a high degree of immunity against turkey and fowl viruses. Both turkey and fowl viruses protect chickens against the four viruses used."

Experimental transmission of *Trichomonas gallinae* from the chicken to other birds, N. D. LEVINE, L. E. BOLEY, and H. R. HESTER. (Univ. Ill.). (*Amer. Jour. Hyg.*, 33 (1941), No. 1, Sect. C, pp. 25-32, pl. 1).—The results of further feeding experiments (E. S. R., 84, p. 107) on the transmission of *T. gallinae* from the upper digestive tract of the chicken to the turkey, bobwhite quail, canary, and English sparrow are reported. Characteristic lesions were produced in those birds, and a light infection without lesions was similarly produced in 1 of 11 ducklings. "An unsuccessful attempt was made to infect 2 ring-neck pheasants and a starling by feeding cultures of the *Trichomonas*. In view of the similarity of morphology in a variety of natural hosts and ease of transmission from one natural host to any other and to many species of birds in which natural infections have not been found, it is apparent that all the trichomonads so far reported from the upper digestive tract of birds belong to a single species, *T. gallinae*." A list is given of 46 references to the literature.

AGRICULTURAL ENGINEERING

[Agricultural engineering investigations of the Bureau of Agricultural Chemistry and Engineering] (U. S. Dept. Agr., Bur. Agr. Chem. and Engin.

Rpt., 1940, pp. 63-80).—Chemical engineering research covered agricultural fires and dust explosions. Farm-structures research dealt with farmhouses, potato storage, the farm-building plan service, silage-pressure studies, corn storage, wheat storage, and grain-sorghum storage. Farm mechanical equipment work was concerned with pest-control equipment and methods, fertilizer-distributing machinery, and crop-production machinery. Investigations on mechanical processing of farm products covered ginning and packing of cotton and fiber-flax processing. Rural electrification research on heating outdoor chick and pig brooders, warming drinking water, lighting dairy barns, and capturing moths of the European corn borer is also reported upon briefly.

[Engineering investigations and operations of the Soil Conservation Service] (*U. S. Dept. Agr., Soil Conserv. Serv. Rpt., 1940, pp. 37-38, 39-40, 52-54, 56-58*).—Demonstration and instruction in the use of farm equipment for conservation work, planning of more than 36,000 miles of terraces and diversions for the protection of approximately 500,000 acres, erosion-control work on highways, expansion of drainage work, technical assistance to farmers in improved irrigation methods, work on the Florida Everglades project, and the preparation and distribution of engineering handbooks to provide specifications and standardization for satisfactory field construction work on submarginal land are briefly reported, together with work on the development of small water facilities in the arid and semiarid sections of the country, hydrologic studies, sedimentation studies, drainage investigations, and irrigation investigations.

[Agricultural engineering investigations by the South Dakota Station] (*South Dakota Sta. Rpt. 1940, pp. 64-66, fig. 1*).—These have included work on rammed-earth construction, by R. L. Patty, H. M. Crothers, and H. H. DeLong; comparative tests of galvanized and painted steel fence posts, by Patty; hard-surfaced floors for poultry houses, by Patty and L. F. Larsen; and an investigation of the causes of mechanical injury to barley, by DeLong and Larsen (comp. N. Dak. and Minn. Expt. Stas. et al.).

[Agricultural engineering at the Texas Station]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1939, pp. 122-125, 151-154, 177-180, 198-200*).—Brief notes are given on mechanical harvesting of cotton, as studied by H. P. Smith, D. T. Killough, D. L. Jones, and M. H. Byrom; efficiency in distribution and placement of cottonseed and fertilizer, treatment of cottonseed for planting purposes, and atmospheric exposure of wire and fencing, all by Smith and Byrom; and garlic drying, by Smith and G. E. Altstatt. Soil and water conservation work at the Tyler, Temple, and Spur Substations is also reported by J. B. Pope, O. C. Word, and J. C. Archer; H. O. Hill; and R. E. Dickson, B. C. Langley, and C. E. Fisher, respectively.

[Irrigation, drainage, and ground-water investigations by the Utah Station] (*Utah Sta. Bul. 294 (1940), pp. 9, 76-79, figs. 5*).—This report notes irrigation surveys covering more than 207,000 acres, water-application efficiencies in irrigation and their relation to irrigation methods, snow surveys, and the application of hydromechanics to the design of structures for controlling ground water, the last-named study dealing with pumping-wells as the most practical solution for the problem of the drainage of lands waterlogged from underlying artesian basins.

Water supply and sewage investigations [at the New Jersey Stations] (*New Jersey Stas. Rpt. 1940, pp. 105-107, fig. 1*).—These are briefly summarized under the following captions: Can copper or brass piping always be used for household water supplies? Is there a standard chemical procedure for the treatment of sewage? What is the activated sludge process of sewage treatment? Is the sewage received from a given system always uniform in character? Is there any way of reducing the size of the sedimentation tanks which take up so much

space and represent so much of the capital outlay involved in building a sewage treatment plant? Cannot the industries of this State be compelled to cease polluting our waters? Are the results of investigations in water and sewage problems being applied for the benefit of other departments in the State?

Surface water supply of the United States, 1938.—Part 6, **Missouri River Basin** (*U. S. Geol. Survey, Water-Supply Paper 856* (1940), pp. VII+419, pl. 1).—This paper records measurements of stream flow in this basin for the year ended September 30, 1938.

Rapid increase in irrigation wells prompts survey by station: Purposes are explained, W. E. CODE (*Colo. Farm Bul. [Colorado Sta.], 3* (1941), No. 1, pp. 7-8).—This brief article calls attention to the rapid increase in irrigation pumping brought about by drought demands and the presence of cheap electric power, and explains that the survey work of the station during the past 12 yr. has been undertaken for the purpose of developing efficient utilization of the water resources of the State and not to bring about any unnecessary restrictive legislation.

Supplemental irrigation, F. E. STAEBNER (*U. S. Dept. Agr., Farmers' Bul. 1846* (1940), pp. [2]+74, figs. 42).—The most important of the numerous varieties of possible equipment are here discussed. Under the head of water supply are taken up quality, quantity, surface supplies, stream measurements, use of small and flash-type streams, underground and municipal water supplies, and legal requirements. The various available pumps and power outfits are dealt with in similar detail, as are also transportation, distribution, determination of the proper time for irrigation, choice of equipment, and plant-design information. The publication supersedes *Farmers' Bulletins* 1529 (E. S. R., 58, p. 77) and 1635 (E. S. R., 64, p. 181).

Natural water loss in selected drainage basins, G. R. WILLIAMS ET AL. (Coop. U. S. D. A. et al.). (*U. S. Geol. Survey, Water-Supply Paper 846* (1940), pp. IV+62, pls. 2, figs. 5).—This report, prepared in cooperation with the U. S. D. A. Soil Conservation Service et al., is primarily a statistical study that presents the results of computations of annual water loss, or annual rainfall minus annual run-off, for river basins in the humid or semiarid regions east of the Rocky Mountains. Sample computations are given, and the various steps and probable accuracy of the results are discussed.

Infiltration of water into the soil: A list of references relative to the physical aspects of the principal factors affecting the rate and its measurement, J. M. DAVIDSON (*U. S. Dept. Agr., Soil Conserv. Serv. Bibliog. 3* (1940), pp. [4]+76).—References arranged alphabetically by authors are concerned, with but few exceptions, with the capacity for and the rate and quantity of infiltration, papers not dealing with measurement or calculation of such data being, for the most part, omitted from the list. Each reference is accompanied by a brief indication of the nature of the cited material.

Designs for suspended-load samplers based upon an experimental investigation of the disturbances caused by the instruments and analysis of sediment-laden flow, J. P. O'NEILL (*U. S. Dept. Agr., Soil Conserv. Serv., 1940, SOC-TP-33*, pp. [49], figs. 28).—Testing numerous grab samplers, both of the horizontal tube and the cutter types, the author found the Eakin cutter-type sampler⁷ to cause the least disturbance of flow in the sampling space. They were able, however, to reduce the disturbance of flow still further by removing the support rod from the center of the sampling space, eliminating the trip cord and a 0.25-in. recess at the top of the sampling space, and using a thin-walled cutter tube. In the improved model here described and figured the mechanism

⁷ Eakin, H. M. *Amer. Geophys. Union Trans.*, 16 (1935), pt. 2, pp. 467-472, figs. 7.

is supported from the rear and is enclosed in a streamlined housing. An additional improvement in flow pattern was secured on protecting the sampling space from the stream filaments diverted into it by the body sections by means of thin horizontal plates placed above and below the sampling space and extending to the sides and upstream.

Appendixes 1, 2, and 3 contain complete drawings and specifications for a multiple-unit sampler and for two forms of the single-unit sampler.

Alkali reclamation investigations, R. S. SNYDER, M. R. KULP, G. O. BAKER, and J. C. MARR. (Coop. U. S. D. A.). (*Idaho Sta. Bul. 233 (1940), pp. 34, figs. 9*).—The experiments reported upon included irrigation and drainage, treatment with chemicals and other soil amendments, establishment of alkali- and water-resistant crops, and work with some forest and shade trees on the Helms farm near Caldwell.

It was concluded, in part, that drainage is the most important factor in economical alkali-land reclamation. Where the soil is porous or semipermeable and natural underground drainage can be secured, the recovery of such areas is only a question of time, dependent upon the kind and quantity of salts present and the degree of percolation. When the soils have become highly deflocculated because of the nature and concentration of the alkali salts present, however, the impervious condition of the soil overcomes the value of drainage as far as economical reclamation is concerned. Irrigation waters will not penetrate such soils to any great depth, and no economical artificial method of improving the vertical drainage has been developed. "The best method of reclamation for such alkali lands, at least from the standpoint of economical recovery, seems to lie in the practice of irrigation with as little disturbance of the surface soil as possible. The native vegetation should be left untouched so that it will serve as a cover or shade for the protection and establishment of crops. Perennial legumes and grasses appear to be best suited to these soils. When the crops have become established on the more permeable areas they will gradually encroach upon the impervious spots and, through the additions of organic matter and because of increased carbon dioxide activity, will gradually overcome the impervious nature of these areas and bring about their recovery."

Such chemical treatments as the use of gypsum, sulfur, sulfuric acid, etc., effected flocculation in varying degrees and correspondingly increased the permeability. Their cost was too high to permit economically feasible reclamation, however.

The coniferous trees could not be established. Deciduous trees could be grown successfully on alkali soils of the more pervious types. They could not be established with any degree of success on the more alkaline impervious soils.

The irrigation waters used contained some sodium carbonate, chloride, and sulfate. Their sodium and potassium content somewhat overbalanced their calcium and magnesium content. The waters used consisted mainly of seepage and waste from higher irrigated lands. Despite these characteristics, "it appears that all types of soils on the Helms tract, even the more impervious, were benefited rather than harmed by these waters. Irrigation waters of a similar character have been used on other tracts in Idaho without noticeable harm to the soil."

The slotted-templet method for controlling maps made from aerial photographs, H. T. KESSE (U. S. Dept. Agr., *Misc. Pub. 404 (1940), pp. 30, figs. 22*).—Methods for the accurate mapping from aerial photographs of areas in which ground-control points are few and widely separated are here discussed. The earlier or hand-templet method consisted in transferring to a transparent templet (film of cellulose acetate or nitrate) the principal point of each photograph, together with lines radial to the principal point and passing through

the image points located on the photograph. These templets were so assembled that all the radials common to each identified position intersect, the intersection being the true location of the point. Distortion of the transparent templets by humidity and temperature changes was found considerable. Limitations in the possible accuracy of the drafting introduced further error. It is also pointed out that, if tilt is present, the radials will not intersect but will form triangles of error, and the elimination of these is a matter requiring considerable experience and, at the best, is largely a matter of personal judgment and compromise. In the slotted-templet method the radial line on the templet is replaced by a radial slot, in which a close-fitting round stud is inserted, free to slide along the longitudinal axis of the slot. The slot takes the place of the line. The templet material need not be transparent, therefore, and can be made of stiff material not subject to the distortion of the flexible cellulose ester sheets used for hand templets. The rigidity of templet material permits the laying of all of the templets having cuts to the same common point over the stud representing that point. The stud and the templets being of rigid material, motion is possible only along the longitudinal axes of the slots. The templets therefore tend to adjust themselves into theoretically perfect positions. A hand cutter for slotted templets and a more elaborate machine, capable of being set to change scale automatically so as to cut templets to any scale between one-half that of the photograph and twice that of the photograph, are briefly described.

Tests at Beltsville, Md., and elsewhere indicated that the limitations of the system would not prevent its use in making an aerial planimetric map of any portion of the United States, using only the existing control and the type of photographs at present available.

Farm electrification in Idaho, H. BEESFORD (*Idaho Sta. Bul.* 237 (1940), pp. 32, pl. 1, figs. 52).—This is an abundantly illustrated popular summary of the progress of rural electrification in Idaho, with a brief statement concerning current research projects. It is noted that 64.2 percent of all occupied Idaho farms have electric service, as compared with the national average of 27.8 percent, and that 87.44 percent of Idaho farms with dwellings valued at more than \$700 now have electricity. The kilowatt-hour use by the farms of Idaho is twice the national average for domestic service.

Electric motors for the farm, H. L. GARVER, O. A. BROWN, J. T. BOWEN, and R. B. GRAY (*U. S. Dept. Agr., Farmers' Bul.* 1858 (1940), pp. [2]+29, figs. 17).—Following a brief introduction dealing with advantages over other sources of stationary power, this publication defines, in a manner intended to be clear to readers without technical knowledge of electric power, some necessary electrical terms; and proceeds to brief, partial descriptions of the split-phase, repulsion-induction, capacitor, and universal types of the single-phase motor. Selection of the type of motor best suited to a given set of power requirements is taken up, together with the care of motors. A tabular discussion of motor troubles is included, as are also suggestions concerning mounting of motors, types of drive, pulleys and pulley ratios, and motor control and protection. A popular explanation of the fundamental principles of electric motors concludes the publication.

Farm power machinery ([*New York*] *Cornell Sta. Rpt.* 1940, p. 91).—Improvements in design are briefly discussed by B. A. Jennings and F. W. Barrett, for a grain-drill arrangement for planting peas and beans with side-band fertilizer placement and hoe openers for the seed so spaced as to avoid fouling, a corn planter having three seed hoppers on a grain-drill frame with provision for side-band fertilizer placement, and an improved tractor-potato digger hitch.

[Weatherproofing and fireproofing studies on wood by the West Virginia Station] (*West Virginia Sta. Bul.* 298 (1940), p. 35, fig. 1).—A brief note of work by H. D. Erickson on effects of fireproofing chemicals on the swelling and strength of woods.

AGRICULTURAL ECONOMICS

[Problems in agricultural economics and rural sociology]. (Partly coop. La. and Minn. Expt. Stas. et al.). (*U. S. Dept. Agr., Sec. Agr. Rpt.*, 1940, pp. 1-197, 130-137, 142-148, 171-173).—The economic and social implications of the war and of national defense as they relate to agriculture are discussed, together with such related topics as land use planning, social implications of science, and teamwork by research men and farmers.

[Investigation in agricultural economics by the Cornell Station 1939-40]. (Partly coop. U. S. D. A.). ([*New York*] *Cornell Sta. Rpt.* 1940, pp. 79-91).—Some general findings are included for the following studies: (1) The production and marketing of fruits, by G. P. Scoville; (2) farm-management study of Livingston County, and (3) farm tenancy in the State, both by S. W. Warren; (4) organization of up-State milk markets, by L. Spencer; (5) changes in demand for milk, cream, and evaporated milk in the New York metropolitan area, by Spencer; (6) costs of operating farm motortrucks in marketing fruits and vegetables, by M. P. Rasmussen and P. S. Williamson; (7) an analysis of methods and practices involved in the distribution of apples and competitive fruits in New York City by chain and independent retailers, by Rasmussen; (8) an analysis of the amount and grade of potatoes sold in retail stores offering choices in Buffalo, Rochester, and Syracuse, by P. J. Findlen and Rasmussen; (9) marketing procedures and prices of eggs, by A. Van Wagenen; (10) fruit marketing, by F. A. Harper, M. E. Cravens, and M. D. Woodin; (11) marketing New York livestock, by W. M. Curtiss and E. H. Matzen; (12) factors affecting the costs of co-operative farm fire insurance, by W. Powell and A. W. Peterson; and (13) rural health administration and financing in New York, by M. P. Catherwood and F. A. Coffey.

[Investigations in agricultural economics by the Ohio Station] (*Ohio Sta. Bimo. Buls.* 207 (1940), pp. 174-177, 178; 208 (1941), p. 13).—No. 207 includes an article on agricultural land use as affected by strip mining of coal in eastern Ohio, by H. R. Moore and R. C. Headington, based on a study in cooperation with the U. S. Department of Agriculture. It describes the extent, present and future of strip mining in the State, and discusses its effects on the tax system and community life in the area so mined, the possible use of strip-mined tracts, etc.

The tables of indexes of production, prices, and income, by J. L. Falconer, are brought down through August 1940 in No. 207 and through October 1940 in No. 208.

[Investigations in agricultural economics by the Oklahoma Station, 1938-40] (*Oklahoma Sta. Bim. Rpt.* 1939-40, pp. 10-24, figs. 6).—In addition to results previously noted, tables, charts, and short statements are included showing the relation between size of farm and farm income; the effects of the soil conservation program on yields, farm income, and time required for farm operations; marketing of dairy products; cooperative marketing in the State in 1937; cars of wheat of different grades shipped into and from Enid in the 1939 marketing year; cooperative marketing of wheat in 1937; operating costs and earnings of small elevators; real estate instruments recorded in Payne County, 1895-1939, for properties in or at the edge of mineral areas and outside such areas; and the percentages of tax collection by school districts by periods

1918-39 located entirely within oil areas, just outside such areas, and entirely removed from such areas.

[Investigations in agricultural economics by the South Dakota Station, 1939-40] (*South Dakota Sta. Rpt. 1940, pp. 72, 75*).—In addition to findings previously noted, brief statements are made as to (1) the relative changes in purchasing power of livestock and field crops, 1890 to 1939, and of the advisability of expanding the cash grain area based on a study of prices by W. H. Peterson; and (2) mortgages in 1939 as compared with 1894 and 1938 as shown by a study under the leadership of G. Lundy.

[Investigations in agricultural economics by the Texas Station, 1939]. (Partly coop. U. S. D. A.). (*Texas Sta. Rpt. 1939, pp. 99-107*).—The objectives and procedures being used in different projects on agricultural adjustment, operating costs and financial conditions of gins, marketing of turkeys, factors affecting the equitable assessment of rural and urban properties, factors affecting the collection and expenditure of taxation revenues, and the economic significance of different farm leasing systems are described. In addition to results previously noted, findings are reported (1) by C. A. Bonnen, A. C. Magee, and B. H. Thibodeaux as to farm earnings in 1939 on different soil types in the Rolling Plains area of the State and the effects of crop yields, size of farm, and acreage in cotton on the earnings; (2) equations, by W. E. Paulson and L. P. Gabbard, for estimating total costs and determining profits for different types of cotton gins in eastern and western Texas; (3) brief statement by Gabbard and H. C. Bradshaw as to trends of the tax-price ratio for farm and ranch lands 1913 to 1938; (4) brief general statement by Bradshaw and Gabbard as to available funds and expenditures for certain purposes by counties in 1935; and (5) brief general statement by C. H. Hamilton and Gabbard as to the effects of mechanization and government benefit payments on farm leasing arrangements and the percentages of noncash farm income accounted for by livestock products consumed at home.

[Investigations in agricultural economics by the Utah Station, 1938-40] (*Utah Sta. Bul. 294 (1940), pp. 16-26, fig. 1*).—In addition to results previously noted, brief statements of some findings are included as to studies of types of farm organization in Sanpete and Sevier Counties; dairy farms in the Ogden milk-shed area; sheep production in Iron, Washington, and Beaver Counties; agricultural resources in western Box Elder County; type-of-farming areas; diversified, specialized, and part-time farming; the relation of income to production; trends in Utah's agriculture; and agricultural credit and farm mortgage indebtedness in the State.

[Investigations in agricultural economics by the West Virginia Station, 1938-40] (*West Virginia Sta. Bul. 298 (1940), pp. 29-32*).—In addition to findings previously noted, brief statements are included as to increase in pasture improvement in Upshur County from 1937 to 1939 under the experimental program, and as to the percentages of apples of different grades packed in 1938 by 24 packing houses in the eastern Panhandle area and percentages of packing costs for different items.

The classification of land (*Missouri Sta. Bul. 421 (1940), pp. 334, figs. 9*).—Included are a foreword by C. H. Hammar, an introduction by M. M. Kelso and C. E. Kellogg, and the following papers, with discussions thereon, presented at the First National Conference on Land Classification, held at the University of Missouri from October 10-12, 1940: Productivity Ratings of Soil Types, by J. K. Albeiter (pp. 13-24) (U. S. D. A.); Primary Soils Features Considered in Land Classification, by C. W. Conrey (pp. 33-36) (Ohio State Univ.); Land Classification in Relation to the Soil and its Development—I, Physical Aspects, by H. H. Krusekopf, and II, Chemical Aspects, by W. A.

Albrecht (pp. 39-53) (Univ. Mo.); Land Classification as an Appraisal and Credit Aid, by A. B. Lewis (pp. 58-71) (U. S. D. A.); Land Classification as an Aid in Real Estate Assessment, by R. R. Renne (pp. 77-92) (Mont. State Col.); Relationship of Soil Classification to Land Classification, by R. S. Smith (pp. 95-99) (Ill. Expt. Sta.); Materials and Techniques of Modern Land Classification, by J. J. Haggerty and A. M. Meyers, Jr. (pp. 100-123) (U. S. D. A.); Land Classification for Rural Zoning, by G. S. Wehrwein (pp. 135-148) (Univ. Wis.); Land Classification Along the Rural-Urban Fringe, by L. A. Salter, Jr. (pp. 147-156) (Univ. Wis.); The Theory of Land Classification—I, The Contributions of Soil Science and Agronomy to Rural Land Classification, by C. E. Kellogg (U. S. D. A.), II, The Contributions of Geography to Land Classification, by G. D. Hudson, and III, The Contributions of the Economist to Theory of Land Classification, by M. M. Kelso (pp. 164-200) (U. S. D. A.); The Classification of Lands for Forest Management, by J. R. Camp (pp. 203-211) (U. S. D. A.); The Classification of Grazing Land for its Future Use and Management, by R. H. Rutledge (pp. 219-227); Classifying Land to Facilitate Adjustment in the Great Plains Area, by E. A. Starch and W. W. Pate (pp. 233-239) (U. S. D. A.); Land Classification to Determine the Feasibility of Reclamation Projects, by J. C. Page (pp. 247-255); Land Classification in Relation to Recreational Land Use, by C. L. Wirth (pp. 261-269); Land Classification in the Public Domain, by J. B. Bennett and R. K. Coote (pp. 274-282); Land Classification for General Land Use Planning, by C. P. Barnes and H. A. Vogel (pp. 283-288) (U. S. D. A.); Land Classification as an Aid in Soil Conservation Operations, by E. A. Norton (pp. 293-304) (U. S. D. A.); and Land Classification and Farm Management, by R. R. Hudelson (pp. 313-326) (Univ. Ill.).

Planning the physical layout of farms, O. W. HOWE. (Coop. U. S. D. A.). (*Minnesota Sta. Bul.* 350 (1940), pp. 20, figs. 12).—"The purpose of this bulletin is to present a systematic procedure and technic in planning a farm lay-out. The factors which must be considered are discussed, and methods of transition from the present practices to the new plan are suggested. This discussion closes with an example showing the application of such planning and transition to a given farm."

Operation of Webber demonstration farm, 1929-1938, C. LARSEN (*South Dakota Sta. Cir.* 31 (1940), pp. 31, figs. 15).—"The operation of a 480-acre farm in Hughes County is described. Tables show by years the income from different sources, expenses for feed and seed, labor, gas and oil, and miscellaneous items, and family labor income."

A study of land utilization in Providence County, Rhode Island, B. EL GILBERT (*Rhode Island Sta. Bul.* 275 (1940), pp. 27, figs. 5).—"This third bulletin in the series on land utilization in the State (E. S. R., 80, p. 548) is based on data obtained in land cover surveys made during the years 1936-38 and the soil resurvey being made by the station in cooperation with the U. S. Department of Agriculture. Tables, maps, and a chart are included and discussed showing by towns the acreages in different crops, kinds of timber, the soil types, the estimated acreages of cover types on different soil types, and the estimated acreages classified as suitable for commercial agriculture, adapted to livestock and dairy farming and to forestry uses, and land unadapted to agriculture and forestry."

An economic study of the dairy enterprise in northeastern Iowa, R. K. BUCK, J. A. HOPKINS, and C. O. MALONE (*Iowa Sta. Res. Bul.* 278 (1940), pp. 353-375, figs. 4).—"This bulletin dealing with factors affecting profits from dairying, amounts of dairy income per cow, capital investment, cash expenditures, feed, and other costs is the second bulletin (E. S. R., 84, p. 404) based on records

kept during 1935 and 1936 on farms in northeastern Iowa. The study is based on the records of 51 herds. In the analysis the herds are divided into 4 groups, 3 of dairy herds (producing less than 200 lb. of butterfat per cow, producing 200-250 lb., and producing over 250 lb.) and dual-purpose herds.

The average investment in the high-producing herds was \$66 per milk cow and \$120 for buildings and fences as compared with \$49 and \$90, respectively, in the low-producing herds. The investment per pound of butterfat produced was lower in the high-producing herds. The high-producing herds were fed more heavily and received better balanced rations. Total concentrates fed averaged 2,300 lb. per cow in the high-producing herds as compared with 1,200 lb. in the low-producing herds. The total values of all feeds plus pasture were \$72 and \$50, respectively, in the two groups. On the basis of pounds of butterfat there was but little difference in the cost of feed. Generally the cow receiving the most feed produced more butterfat but not necessarily in proportion to the difference in amount of feed. Herds fed the highest proportion of roughage had the lowest return per \$100 of feed fed and the lowest butterfat production. Herds fed the highest proportion of grain, however, were among the less profitable herds. On a butterfat production basis, amount and value of feed, cost of labor, and other factors rose with production, but costs rose less rapidly than production. "After credits were made for all products from the herds, including skim milk and manure, total income was sufficient to pay local market rates for feeds, cash expenses, and interest on investment, and to allow about 21 ct. per hour for labor in the high-producing herds under 1935-36 price levels, with butterfat at about 34 ct. per pound. The low-producing dairy herds, however, earned only 15 ct. per hour and the dual-purpose ones only 8 ct. per hour. Returns from beef produced in the dual-purpose herds were not sufficient to overcome the economic handicap from low butterfat production as compared to the herds of dairy-type cows." Detailed labor records on 10 farms showed an average of 131 hr. of labor per year for each milk cow and 143 hr. if young stock was included.

A farm management and cost study of strawberry farms in southeastern Louisiana, 1937-38, J. N. EFFERSON (*Louisiana Sta. Bul. 326 (1941), pp. 31*).—Detailed records of the farm business for the year ended June 30, 1938, were obtained for 144 farms in the Ponchatoula-Hammond and Independence areas of the Tangipahoa Parish strawberry area. Supplementary information on the costs and returns from the strawberry enterprise was obtained from 94 of the farmers interviewed. The most important factors affecting financial returns from farming on the 144 farms are discussed.

The average size of farm was 27 acres, of which 10.5 acres were in crops. Due to double cropping an average of 16.2 acres of crops were grown per farm. In the Ponchatoula-Hammond area an average of 3.6 acres of strawberries and 13.4 acres of all crops and in the Independence area 7 acres of strawberries and 19.4 acres of all crops were grown. The average labor income and labor earnings in the two areas were \$24 and \$285 and \$5 and \$319, respectively. The average cost of producing strawberries on the 94 farms was \$1.61 per crate, of which 9 percent was for growing the plants, 45 percent for growing the crop, and 46 percent for harvesting and marketing. The average total return, including receipts from shipments of packed berries, sales of stemmed berries, sales of strawberry plants, and the value of berries used by the farm families, was \$1.88 per crate. The average net return was 27 ct. per crate, or 7 ct. with single-row and 31 ct. with double-row production. In the Ponchatoula-Hammond area the average production of strawberries was 165 crates per acre and the average labor required to grow and harvest an acre was 131 10-hr. days, as compared with 82 crates and 81 10-hr. days

in the Independence area. The average net returns per crate were 32 and 10 ct., respectively, in the two areas.

Sugar beet costs and returns in Michigan. K. T. WRIGHT (*Michigan Sta. Spec. Bul. 305 (1940), pp. 45, figs. 12*).—This bulletin is based chiefly on from 45 to 95 records per year (total 279 records) on costs of production and returns from sugar beets kept by cooperating farmers from 1933 through 1936. General information is included on the history of the sugar beet industry; the production of beet sugar in the world, the United States, Michigan, and other States; the economic conditions during the study; and the farms included in the study. Tables are included and discussed showing usually for each year, with averages for the 4 yr., the costs by items in the production and delivery of sugar beets per farm, per acre, and per ton. Comparisons are made with yields and costs in other States in 1930 and 1931. The variations among the farms studied as to acres in beets, planting date, number of cultivations, yields, distance to sugar factory, and costs per ton are shown in charts and discussed. An analysis is made of the effects on costs and returns of yield per acre, soil type, drainage, date of planting, distance between rows, beet acreage per farm, machine work efficiency, hand labor costs, distance to factory, etc.

The farms studied averaged 150 acres, with 115 acres tillable and 15 in sugar beets. The average production of sugar beets for the 4-yr. period was about 10 tons per acre. The average cost of production was about \$39 and the cost of marketing approximately \$9 per acre. The income totaled about \$70 and the net income approximately \$22 per acre. Costs of production per ton averaged \$4.03 and marketing costs 89 ct. Receipts from beets averaged \$6.08 per ton, from Government benefit payments 69 ct., and from beet tops 35 ct. The average net return per ton was \$2.20. An average of approximately 85 hr. of man labor, 26 hr. of horse work, and 2½ hr. of tractor use was required per acre. Of the total cost of production and marketing, hand labor made up about 33 percent, grower's labor and use of power and machinery 18, land use 16, other production costs 15, and marketing costs 18 percent. Total production costs per ton during the 4 yr. varied from approximately \$3 to \$10 per ton and averaged about \$4. The costs for half of the growers were between \$3.20 and \$4.80 per ton and for two-thirds of the growers between \$2.80 and \$5.20 per ton. Growers with yields of approximately 6½ tons per acre had a production cost of \$5.74 per ton and the net returns per acre were \$3.21, as compared with \$3.21 and \$39.90, respectively, for those averaging approximately 13 tons per acre.

A survey of practices and costs of producing grass silage on 50 New Jersey farms. J. W. CAENECROSS, A. G. WALKER, and E. RAUCHENSTEIN. (Coop. U. S. D. A.). (*New Jersey Sta. Bul. 684 (1940), pp. 16, figs. 6*).—Data were gathered from 50 farms putting up grass silage in 1938. The kinds of farms using grass silage; reasons for ensiling legumes and grasses; stage at which alfalfa is cut for the silo and the time between cutting and ensiling; amount of molasses added; care of alfalfa silage; and time, labor, and power used in harvesting and ensiling different kinds of silage, etc., are analyzed and discussed and comparisons made.

The average production per acre and the cost of production and harvesting per ton were: Alfalfa 5.2 tons and \$3.09 for the first cutting; mixed grasses 4.2 tons and \$4.94; soybeans 5.5 tons and \$6.41; and corn 8 tons and \$4.98.

Cost of production of tobacco in Puerto Rico, 1937-38 [trans. title], R. HUYKE and R. C. TORRES (*Puerto Rico Univ. Sta. Bul. 56 (1940), Span. ed., pp. 28; Eng. abs., pp. 26-28*).—Tobacco, the second most important crop of the island, has come to disaster because of low prices in recent years. It was hoped that this study would help improve the situation. The total cost per cuerda (0.9712 acre) of seedbeds under shade averaged \$384.47, while costs of open-field

seedbeds averaged \$216.54. The cost of producing a cuerda of tobacco was \$116.05, or \$12.95 per quintal of barn-dried tobacco. The net cost per hundredweight was \$12.90. The authors also present data concerning other factors influencing the costs of producing tobacco.

Gross farm income and indices of farm production and prices in the United States, 1869-1937, F. STRAUSS and L. H. BEAN (*U. S. Dept. Agr., Tech. Bul. 703* (1940), pp. V+154, figs. 57).—"In this bulletin an attempt has been made (1) to assemble the best data on farm production, farm prices, and farm income for individual farm products; (2) to correct for inadequate data; and (3) to combine the estimates for individual products into measures of total farm production, an index of farm prices, and a measure of total gross income. These series are carried back, on an annual basis, to 1869."

The sources of data and the methods of estimating the production, price, and income from the individual farm products and determining the gross agricultural income and computing the indexes of production, price, and gross income are described. Tables and charts show by years the production, price, and gross income from individual products and groups of products, and the indices of farm production and prices and of gross agricultural income.

Operating methods of Challenge Cream & Butter Association, P. E. QUINTUS (*U. S. Dept. Agr., Farm Credit Admin. Cir. C-119* (1940), pp. 11+45, figs. 12).—"The Challenge Cream & Butter Association of Los Angeles, Calif., is a regional sales agency owned and controlled by cooperative creameries. It is distinguished by the fact that it handles a complete line of dairy products. Its general scheme of operations, started in Los Angeles in 1911, is to market all member products under Challenge brands through a direct system of distribution. Local cooperative units scattered throughout the far western States which depend on the California markets for an outlet make up the membership under a federated plan."

The circular describes the special features of the structure and operation of the association in sections on the structure of the marketing system dealing with the affiliated locals, distributing plants, and the whole-milk business; the business operations; corporate and cooperative features; capital structure; and settlement methods.

The citrus industry and the California Fruit Growers Exchange system, N. FOGELBERG and A. W. MCKAY (*U. S. Dept. Agr., Farm Credit Admin. Cir. C-121* (1940), pp. [4]+109, figs. 21).—"The purpose of this publication is primarily descriptive. It aims to tell how the Exchange system functions in such detail as to afford other cooperative associations a means for checking their own operating policies. Sufficient detail on organization structure is presented to assist interested groups in forming cooperative marketing associations. A presentation of the principal factors influencing Exchange development and some of the problems and difficulties encountered during its existence may give courage to those to whom a successful example is a powerful help. Finally, as a prerequisite to a better understanding of the development and workings of the Exchange system, the citrus-fruit industry is briefly summarized." The organization structure and general policies of the association and how the exchange system functions at the grove and packing house, its selling procedures, advertising, transportation functions, surplus control, and cost of its service are described and discussed.

The banana industry in tropical America, with special reference to the Caribbean area, 1930-1940, A. M. HANNAY (*U. S. Dept. Agr., Bur. Agr. Econ., Econ. Libr. List 19* (1941), pp. 30).—"This is an annotated list of 93 selected references dealing primarily with the economic aspects of the industry."

Operation of small-lot country fruit and vegetable auctions, E. W. CAKE. (Coop. Cornell Univ.). (*U. S. Dept. Agr., Farm Credit Admin. Cir. C-118* (1940),

pp. IV+40, figs. 7).—"The aim of this study is to provide a general picture of fruit and vegetable marketing at country auctions by describing the development and present status of such markets, the environment in which these auctions operate, the results of their operations, and the reactions of growers and buyers toward them." It is based on a study of 9 auctions in New Jersey, 6 in Delaware, 10 on the Eastern Shore of Maryland, 18 on the Eastern Shore of Virginia, 13 in the southeastern truck-crop area of North Carolina, 1 each in Massachusetts and Florida and 2 each in Connecticut, New York, and South Carolina. The study includes only sales agencies at country shipping points or farmers' markets handling fruits and vegetables delivered by motortrucks, wagons, and automobiles, where physical facilities and an auctioneer were regularly provided. The data were obtained by personal visits with the operators of the auctions, and interviews with 114 buyers at the auctions and 431 fruit and vegetable growers located in their vicinity.

Cooperative purchasing of farm supplies in Georgia, G. M. FRANCIS (*U. S. Dept. Agr., Farm Credit Admin. Cir. C-120 (1940), pp. [2]+38, figs. 13*).—The farm supply requirements of Georgia agriculture, the trends in cooperative purchasing in the State, and the factors and conditions retarding and favoring such purchasing are described. The circular discusses the organization methods, operation facilities, volume of business, etc., of the four principal types of purchasing cooperatives in the State—local cooperative associations, cooperatives set up by the Farm Security Administration, fertilizer associations, and marketing associations providing such service. In the study on which the circular is based, "basic information was obtained during the summer of 1939 from managers of the associations and county agricultural agents. Complete analysis was made of organization structure, operating practices, and financial and operating results for 22 associations for the year 1938-39. The remaining 38 associations surveyed were small informal groups of farmers which assembled and pooled small orders for seed. Sales data for these associations were recorded when found available." A cooperative purchasing program for the State is outlined, in which suggestions are made as to methods for advancing cooperative purchasing in the State.

The food supply of Puerto Rico, E. B. HILL and J. R. NOGUERA (*Puerto Rico Univ. Sta. Bul. 55 (1940), pp. 32, figs. 2; Span. abs., pp. 31-32*).—Tables and charts are included showing for the year 1937-38 the production of different foods for local consumption, the net imports of foods, the retail values of locally produced and imported foods, and the estimated per capita consumption of different foods, with comparisons with white families in North Atlantic and East South Central cities of the United States and Negro families in the Southern cities. Appendixes describe the methods used in obtaining and analyzing the data.

"Puerto Rico in 1937-38 was 65 percent self-sufficient in food production in terms of quantities. It produced practically all the sugar, coffee, and fruit and nuts consumed. Local production contributed with more than 80 percent of the eggs, starchy vegetables, and green and leafy vegetables. Sixty-six percent of the dairy products and half the meat consumed were locally produced. On the other hand, it depended entirely on outside sources for its consumption of fats and oils and cereals and preparations, and imported 89 percent of the fish and 60 percent of the legumes it consumed."

Of the Puerto Rican consumer's dollar spent for food, 20 percent was sent for cereals, 18 for meats and fish, 13 for starchy vegetables, 11 for dairy products, 9 for green leafy vegetables, 7 for legumes, 6 for sugar, 5 for fats, 5 for fruits, and 6 percent for other products. The comparison with the three United States areas showed Puerto Rico to be deficient in the consumption of dairy products,

fats, meats, eggs, and green and leafy vegetables. It surpassed the other areas only in the consumption of starchy vegetables.

RURAL SOCIOLOGY

The sampling method in social and economic research: A partial list of references, N. G. LARSON (*U. S. Dept. Agr., Bur. Agr. Econ., Agr. Econ. Bibliog.* 90 (1941), pp. VI+155).—An annotated list of 426 books, pamphlets, and periodical articles in the English language, published between January 1928 and June 1940, dealing with the theory, technic, and application of the sampling method in social and economic research, with particular reference to human populations.

Working relationships in governmental agricultural programs, J. A. VINA (Iowa Expt. Sta.). (*Pub. Admin. Rev.*, 1 (1941), No. 2, pp. 141-148).—This essay is based primarily upon Iowa data.

[**Investigations in rural sociology by the Cornell Station**] (*[New York] Cornell Sta. Rpt.* 1940, pp. 174-177).—Brief reports are presented on social attitudes of rural people, by L. S. Cottrell, Jr., L. S. Bee, and H. F. Kaufman; selective factors in rural urban migration, by D. Sanderson and A. A. Gessner; transmission of farming as an occupation, and population analysis, both by W. A. Anderson; and types of families residing on marginal and submarginal land, by Sanderson and Anderson.

[**Studies in rural sociology by the Oklahoma Station**]. (Partly coop. U. S. D. A.). (*Oklahoma Sta. Bien. Rpt.* 1939-40, pp. 160-164, figs. 4).—The station reports that rate of increase in tenancy is becoming slower, and that types of tenancy are closely associated with types of farming. Despite unfavorable economic conditions, the rural birth rate in Oklahoma has remained high. The conclusion is reached that the State's main problem is not one of finding people to exploit its resources but one of finding ways and means of supporting its existing population adequately. The studies were carried on by O. D. Duncan, P. Nelson, and W. H. Sewell.

The plantation South, 1934-1937, W. C. HOLLEY, R. WINSTON, and T. J. WOOLFE, JR. (*Works Prog. Admin.* [U. S.], *Div. Res., Res. Monog.* 22 (1940), pp. XXII+124, pls. 13, figs. 11).—Topics discussed are changes in organization and operation and labor and power, credit, income, operator and tenant income, relief needs, and living conditions.

Rural migration in the United States, C. E. LIVELY and C. TAEUBER. (Univ. Mo. and U. S. D. A.). (*Works Prog. Admin.* [U. S.], *Div. Res., Res. Monog.* 19 (1939), pp. XXI+192, pls. 18, figs. 19).—Topics discussed are rural population movements before and since 1930, migration and rural reproduction, migration and selected socioeconomic factors, migration in selected areas, characteristics of migrants, and the social significance of rural migration.

Colorado people seeking 'greener pastures' set migration record between 1930 and 1940, R. W. ROSKELLEY (*Colo. Farm Bul.* [*Colorado Sta.*], 3 (1941), No. 1, pp. 9-10, 15).—The author discusses intercounty migration in Colorado between 1930 and 1940.

State migration definitely slowed up. (Coop. U. S. D. A.). (*South Dakota Sta. Rpt.* 1940, p. 77).—Data are presented by W. F. Kumlén on migration in and out of the State.

Youth in agricultural villages, B. L. MELVIN and E. N. SMITH (*Works Prog. Admin.* [U. S.], *Div. Res., Res. Monog.* 21 (1940), pp. XXI+143, pls. 9, figs. 14).—The authors present the results of a study of a field survey of 45 villages located in better than average agricultural territory. Topics discussed are mobility, personal characteristics, economically independent youth away from villages,

school attendance and educational attainment, employment, occupations, financial status, and social and recreational activities.

AGRICULTURAL AND HOME ECONOMICS EDUCATION

Canadian farm problems (*Canad. Farm Prob., Econ. Ser. Nos. 10 (1941), pp. [2]+25; 11, pp. [2]+11; 12, pp. [2]+10; 13, pp. [2]+14; 14, pp. [2]+16; 15, pp. [2]+22; 16, pp. [2]+14*).—These pamphlets continue the series (E. S. R., 84, p. 545). No. 10 is entitled Government Grading and Marketing—Do They Help the Farmer? No. 11, What Do We Need for Efficient Marketing? No. 12, What Can the Farmer Gain Through Organization? No. 13, Will Cooperation Solve the Farmer's Troubles? No. 14, Is Government Control of Marketing Desirable or Practicable? No. 15, If Regulation is Adopted, What Should It Be? and No. 16, What Should We Do About It?

FOODS—HUMAN NUTRITION

Public health in national defense, W. S. LEATHERS (*Amer. Jour. Pub. Health, 30 (1940), No. 11, pp. 1269-1275*).—In this 1940 presidential address before the American Public Health Association, the importance of nutrition in national defense is emphasized as follows:

"The new science of nutrition may profoundly affect the economic and social structure of future civilization. We know now that much ill health, physical disability, disease, and incapacity which have heretofore been poorly understood and regarded as inevitable are caused by faulty diet and are preventable. The knowledge gained in the laboratory and clinic must be applied as soon as possible to the general population. If our nutritional requirements are pushed to the background during a period of emergency, disastrous results are inescapable. The present war is a 'war of nerves,' and the issue may well depend upon whether or not the people are able to withstand the physical and mental strain to which they may be subjected. The nutritional status of the nation's population will certainly be a determining factor."

Food in a world at war, J. S. DAVIS (*Harvard Business Rev., 19 (1941), No. 2, pp. 133-142*).—This article presents a picture of the present and prospective adequacy of supplies of foodstuffs as of October 1940 throughout the world and specifically in Russia and Asia, the British Isles, the European Continent, and in some individual European countries. The main conclusions are that world supplies of foodstuffs are abundant, but that war conditions prevent their effective distribution to consumers to a far greater extent than was true under the abnormal conditions preceding September 1939; that because of war conditions diets are undergoing more or less drastic modifications throughout Europe; that severe shortage of calories seems in prospect in some sections of Belgium, France, and Poland, and perhaps parts of Norway, Finland, and some other countries, and that serious deficiencies in nutritional essentials are increasing in these countries and elsewhere; and that malnutrition due especially to deficiencies in fats, vitamins (especially A and D), and minerals must be expected to increase in continental Europe, with resulting reduction in vitality and rise in death rates.

Britain's food supplies in peace and war, G. SMITH (*London: George Routledge & Sons, [1940], pp. x+280*).—This book, presenting a study of food supply and food policy, was completed during the early days of the war and was subsequently revised, according to the author's note, to include a survey of the effect of the first 6 mo. of the war on the food trades. An account is presented of Britain's principal food supplies (bread, milk and milk products, eggs, meat,

bacon, sea fish, vegetables and fruit, tea, and sugar), both home-produced and imported, and of the methods by which they are distributed to the people. The author also discusses the need for a food policy, particularly as it relates to improving the dietary status of the lower economic groups; the part which a revived British agriculture could play in improving the diet and health of the people; and the basic need in such a program of money to invest in land for development, and a more efficient and cheaper marketing of agricultural products. The final chapters consider food problems in wartime and the improvement in nutrition, in war or peace, through a comprehensive plan for the organization of food supply so that sufficient food to provide the home population with a satisfactory diet can be distributed at the lowest possible prices.

Foods that aided blitzkrieg (*Food Indus.*, 13 (1941), No. 1, pp. 43, 79, fig. 1).—This article, said to be based upon information published in Germany, describes some of the concentrated foods in the German Army ration. Among these are "Edelsoja," a soybean flour with a protein content of from 40 to 45 percent, and "Bratling" powder, a mixture of soybean, grain, and milk albumin spiced with herbs. Both of these may be added to other dishes. Another highly concentrated food is "Pemmikan" made from smoked meat, bacon, soybean flour, dried fruits, whey, tomato pulp, yeast, green peppers, cranberries, and lecithin. This is issued to tank, fortress, and mountain troops and also to air crews. Meat is made to go further and to have higher vitamin value by the addition of germinating grains. Many foods, including tomatoes, cheese, jam, and applesauce, are distributed in dried form. Various dehydrated vegetables are compressed into brick forms, and roasted meat is compressed in corrugated cardboard boxes and frozen gradually. It is stated that "American quick freezing methods are extensively used for meats, fruits, and vegetables, and the German military authorities are lavish in their praise of the system, especially as a means of preserving vitamins."

Foods and nutrition [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt.*, 1940, pp. 7-12).—In this annual report (E. S. R., 82, p. 697) are summarized studies of the Foods and Nutrition Division bearing on nutritional requirements for vitamin A (E. S. R., 83, p. 707), and on the vitamin B₂ content (E. S. R., 83, p. 131) and the proximate (E. S. R., 83, p. 699) and mineral constituents of foods; and work pertaining to food utilization, including studies on food quality and palatability, food preservation, and the utilization of surplus foods.

[Foods and nutrition research of the Texas Station]. (Partly coop. U. S. D. A. et al.). (*Texas Sta. Rpt.* 1939, pp. 18, 114-117).—Progress reports, most of which represent an extension of earlier work (E. S. R., 82, p. 554), are given by W. W. Meinke and R. Treichler on variations in the vitamin content of human foods; by S. Cover on chemical and physical factors responsible for tenderness in meat during cooking; by Cover, A. K. Mackey, and C. E. Murphey on the effect of degree of fatness on tenderness of lamb; by J. Whitacre, S. H. Yarnell, G. S. Fraps, L. R. Hawthorn, and B. S. Pickett on the mineral composition of vegetables grown in representative regions of the State; and by Whitacre on the effect of tea upon energy metabolism of children and on regional relationships of body measurements of children.

[Food and nutrition studies by the Utah Station] (*Utah Sta. Bul.* 294 (1940), pp. 13, 14, 72-74, 75-76, 91).—In this progress report summaries are given on freezing preservation of Utah fruits and vegetables, on the appraisal of quality in frozen peas (E. S. R., 83, p. 412), on the ascorbic acid metabolism of college students (E. S. R., 84, p. 711), and on the effect of various factors on the vitamin C content of tomatoes.

Effect of corn, wheat, and barley in the diet on the flavor of fried and roasted chickens. W. E. POLEY, A. ROSENQUIST, and A. L. MOXON. (S. Dak. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 3, pp. 179-190, fig. 1).—The Barred Plymouth Rock cockerels used in this study were taken from three groups of chickens fed either corn, wheat, or barley as the principal constituents of the ration. The rations and the methods of finishing were the same as those used in the study of Poley et al. noted on page 802. The 10 fryers selected from each group at the age of 17 weeks and likewise the 10 roasters selected from each group at 26½ weeks represented birds whose weights were nearest the average for each ration. For birds on the corn, wheat, and barley rations the average dressed weights for fryers were 1,446, 1,457, and 1,359 gm., respectively; for the roasters the respective averages were 2,329, 2,249, and 2,166 gm.

"Records which were kept included the live weights, dressed and drawn weights, weights of head, shanks and feet, entrails, gizzard, heart, liver, neck, and abdominal fat. Each drawn carcass was split longitudinally through the vertebrae and breast into two halves of approximately equal weights. The amounts of light meat, dark meat, skin and subcutaneous fat, and bones were determined for one-half of each uncooked carcass for both fryers and roasters. With the fryers, the other half of each carcass was fried in hydrogenated lard and the weights of cooked light meat, dark meat, skin and subcutaneous fat, drippings, bones, and inedible were taken. Cooking losses were calculated for birds receiving each cereal grain. Half of each roaster carcass was placed on a rack and roasted in an uncovered pan in an electrically heated oven. The amounts of cooked meat and bones were determined in the same manner as with fryers. Nine judges who had been previously tested for taste sensitivity were each given samples of light and dark muscle from each of the fryers and roasters. No appreciable differences could be detected in the aroma, flavor, juiciness, or tenderness of either the light or dark meat from fryers and roasters receiving either corn, wheat, or barley in the growing and finishing rations. There were no significant differences between the dressing and cooking percentages of the fryers and roasters receiving either wheat or barley as the principal constituent of the ration and those receiving yellow corn."

Meat food products (*U. S. Dept. Agr., Bur. Anim. Indus. Rpt., 1940, pp. 44-45*).—A study is noted on the nutritive properties and digestibility of lard and hydrogenated cottonseed oil and of the effect on digestibility of adding stearic acid to olive oil.

Canned Atlantic crab meat: A new American food, C. R. FELLERS and S. G. HARRIS. (Mass. Expt. Sta.). (*Indus. and Engin. Chem., 32 (1940), No. 4, pp. 592-594, figs. 3*).—A new process for the successful canning of the meat of the Atlantic blue crab (*Callinectes sapidus*) is described. The crucial step in the process is the application of a protective brine dip containing small amounts of aluminum and/or zinc salts, which stabilize the copper present in the crab's blood and flesh, thus protecting the meat against turning blue to black in color and developing a strong ammonia flavor after canning.

Data reported on the proximate and mineral (K, Ca, Mg, P, Fe, Cu, and I) constituents of the canned product indicate that it is a good source of protein (18 percent, shown by biological tests to be of high quality) and is rich in Ca (1,330 p. p. m.), Fe (20 p. p. m.), Cu (13 p. p. m.), and I (0.46 p. p. m.). Ascorbic acid, thiamin, and riboflavin are reported, respectively, at 0.012 mg. (24 International Units), 230γ (70 I. U.), and 150γ (60 Bourquin-Sherman units) per 100 gm.

Tenderometer readings as an index of quality of fresh asparagus.—A preliminary paper, R. R. JENKINS and F. A. LEE. (N. Y. State Expt. Sta.). (*Food Res.*, 5 (1940), No. 2, pp. 161-166, fig. 1).—Asparagus (Mary Washington variety), freshly cut in 20- to 30-lb. lots, was taken at three periods during the cutting season from three types of soil (upland sandy, upland light clay, and river bottom), graded as to size (tiny, medium, and jumbo), and cut into 4-in. lengths from the tip end of the spear. These lengths were used for filling the sample chamber of the tenderometer, which was filled full by alternating the spears. Tenderometer readings and the results of crude fiber and dry matter determinations on unblanched samples preserved by freezing and of organoleptic tests on cooked samples of washed, blanched, frozen lots are presented.

Analysis of the data indicated that the tenderometer gave a high correlation for tenderness and quality when compared with crude fiber and organoleptic tests; and that measurements of tenderness by the tenderometer may be made on graded or ungraded samples, depending upon whether or not quality of the asparagus as received, or quality of the individual sizes, is to be determined. Crude fiber content appeared to be an excellent index of maturity, but although crude fiber determinations are of use in control work, they are not practical as an objective method. For such a method the tenderometer would serve admirably. As a tentative maturity standard, based on the readings obtained in the present study, it is suggested that a fancy grade of asparagus should have a tenderometer reading of 150 or lower and a crude fiber content of 0.70 percent or less.

Comparison of organoleptic and physicochemical methods for determining quality in fresh, frozen, and canned lima beans. A. KRAMER and C. H. MAHONEY. (Md. Expt. Sta.). (*Food Res.*, 5 (1940), No. 6, pp. 583-592).—Thirteen varieties of lima beans were used in these tests, quality differences being induced in 2 of these varieties through brine separation and through varying both the time interval between harvest and blanching and the length of the blanching period. Preblanching intervals of 2, 6, 10, and 22 hr. and blanching periods of 45, 90, 180, and 300 sec. at 91° C. were selected. Of the frozen samples, some were dry-packed and some were brine-packed, a 20 percent salt brine being used for these and for the canned samples.

Organoleptic tests were made by four groups of men who graded on a score card basis for odor, color, texture, and flavor of the canned samples, and of the frozen samples after cooking. Qualitative determinations of catalase activity and semiquantitative determinations of peroxidase activity and pigment content proved to be unsuitable as quality indices for these samples. An iodine-threshold test correlated well with organoleptic tests, and appeared, therefore, to be a good measure of the quality of material subjected to various holding periods previous to blanching. The iodine test is a modification of the method suggested by Joslyn et al. for the measurement of vitamin C, but as described measures only the difference between treatments and not the total iodine reducing substances. The iodine test is recommended because of the good agreement between it and the organoleptic tests and because of the rapidity and simplicity of the test and its adaptability to field application. It is noted, however, that overblanching reduces the iodine value significantly more than the organoleptic value, and that there is an inverse relation between the two tests as affected by brine separation. Data presented to show the agreement between the organoleptic and the iodine-threshold tests show, further, that there is no detectable difference in quality between beans frozen in dry- and brine-packs, that bean varieties vary in quality, that of the factors affecting quality preblanching is the most important, and that there is apparently no

relationship between the iodine test on fresh material and either the iodine or organoleptic tests on the frozen samples.

Pectins and the texture of cooked potatoes. M. E. FREEMAN and W. S. KIRCHTE. (Mass. Expt. Sta.). (*Food Res.*, 5 (1940), No. 2, pp. 167-175).—In the experiment reported various pectin fractions were extracted from raw and cooked potatoes to determine whether mealiness is related to cell separation as effected by solution of pectic material. The extracts, obtained by methods noted in detail, included those obtained by extraction with water (1) at 37° C. and (2) at 85°, and by extraction with (3) citric acid and finally with (4) ammonium citrate. Various methods of preparation of the samples for analysis indicated that minimum changes in potato pectin fractions occurred when sliced tissue was rapidly dried in air. Heat treatment barely sufficient to inactivate the enzymes (such as treatment with boiling alcohol) rendered part of the pectin soluble in water. Steaming for 1 hr., as well as the hot alcohol treatment, preserved the largest amount of total pectin, while baking and rapid air drying caused small but significant losses. Fractionation of pectic material, applied to samples prepared by the various methods, indicated that potato pectin consists largely of two fractions, the one, which may be pectic acid or insoluble salts of the acid, being soluble in ammonium citrate (or oxalate) and insoluble in hot water, and the other a fraction easily dispersed by hot water but not by cold water. This latter fraction, so easily removed, is probably not a cellulose-pectin complex of protopectin but rather a lyophilic gel readily peptized by warm water. Analyses of raw and cooked potatoes for water-soluble pectin fractions indicated that the solution or degradation of pectic material does not determine mealiness in potatoes.

Soybean flour as an emulsifying agent in preparation of salad dressings. B. M. WARREN and L. MORSE. (Univ. Calif.). (*Food Res.*, 5 (1940), No. 2, pp. 197-203, figs. 2).—Salad dressings made from cooked and uncooked soybean flours, both whole and benzene-extracted, were compared with those made by the same method with egg yolk and egg white. The comparisons included camera lucida drawings of the oil droplets and quantitative measurements of the relative viscosity. The dressings were made with 105 gm. of cottonseed oil, 22.5 gm. of vinegar (4 percent acidity), 7.5 gm. of spice mix (sugar, salt, and spices), and 75 gm. of emulsifying agent. With each emulsifying agent a series of dressings was prepared in which the concentration of the agent was varied from 3 to 7.5 gm. of solid material, the remainder of the 75 gm. being made up with water.

Dressings made with the soybean flour, particularly those prepared from the benzene-extracted flour, showed higher viscosity than the egg dressings. The high viscosity was accompanied by greater resistance to drainage. The cooked soybean dressings were so viscous that it was necessary to reduce the concentration of emulsifying solids from 3.6 to 2.1 percent in order to incorporate the full amount of oil. From the flavor standpoint the uncooked whole soybean dressings were unacceptable, but all of the cooked dressings were excellent in flavor even after several months' storage. The emulsions employing soybean flour were less finely dispersed than those prepared from an equal proportion of yolk solids, but were practically identical in droplet size to the egg white emulsions. Cooking had no effect on droplet size. Fat-free soybean flour used in one series of dressings to replace egg white in combination with egg yolk had a definite thinning effect. The relatively high viscosity of the soybean dressings suggests the possibility of preparing inexpensive salad dressings containing a low amount of oil, with the soybean flour as the sole emulsifying and thickening agent.

A study of starch from different varieties and types of corn, L. P. TANNER and D. T. ENGLIS. (Univ. Ill.). (*Food Res.*, 5 (1940), No. 6, pp. 563-581, fig. 1).—Four varieties of Illinois corn, Pride of Saline, Sutton, Golden Beauty, and h. h., and one variety each from Argentina and Africa were used in this study. Part of the Sutton variety was frozen on the cob 1 week after harvesting. Starch, prepared from these samples by the method of Woodruff and Hayden (E. S. R., 75, p. 277), was analyzed for moisture, ash, nitrogen, fat (acid hydrolysis), and phosphorus; pH and acidity determinations were made; swelling power, viscosity, and alkali-labile property were determined; and the amyloses were separated and characterized.

Microscopic examination indicated that granules of similar size and shape were in all starches, the differences between the starches being in the ratios of large round granules to small, irregularly shaped granules. Photomicrographs showed that more small granules were to be found in the hard (Golden Beauty, Sutton, Pride of Saline, and Argentina) than in the soft (h. h. and African) varieties. The hard corn starches contained more noncarbohydrate material and formed more viscous pastes than the soft starches and were disintegrated by grinding the corn for 624 hr., whereas this treatment did not disrupt the soft starches. α -Amylose, separated by electrodialysis from the soft starches, was accordingly contaminated with whole granules. Grinding caused contamination of the ash of hard starches, but soft starches were not appreciably contaminated. Electrodialysis at 110 v. did not always separate 5 percent suspensions of ground starch into a clear solution above a gelatinous precipitate of α -amylose. Consequently β -amylose, obtained from alcoholic precipitation of the opalescent liquid, was contaminated with a trace of α -amylose. Results obtained in the present study are considered insufficient to prove that α - and β -amyloses exist as separate entities, but they do suggest that (1) different particle sizes rather than materials may be responsible for the soluble and insoluble fractions and (2) that the nonuniformity of results obtained from "identical" samples may be due to differences in unavoidable contamination and chemical and physical changes.

Licanic acid of oiticica fat and a study of its nutritive value and efficiency, C. F. KREWSON and C. A. ELVEHJEM. (Univ. Wis.). (*Oil & Soap*, 17 (1940), No. 2, pp. 30-33).—Licanic acid, 4-keto-octadecatrienoic acid, 9, 11, 13, isolated as the α -isomer from "oiticica fat" obtained by pressing or by solvent extraction of the kernels of nuts from the Northeast Brazilian tree *Licania rigida*, was tested for nutritive value in feeding trials with rats. The ability of the fat to promote growth in young rats was noted in tests employing animals on a basal ration of mineralized (Fe, Cu, Mn supplemented) skim milk, a 2 percent butterfat supplement being given to two of the rats while two others received 2 percent each of butterfat and licanic acid. In the former group the animals in a 26-day period made good growth at the rate of 2 gm. daily, consuming 2.45 gm. of total solids to produce 1 gm. of weight. In the latter group, however, the daily weight gains averaged but 1.1 gm., with 3.97 gm. of total solids required to produce a 1-gm. weight gain. These results were borne out in a second experiment in which rats restricted in total solid intake to the level consumed by the test group receiving the butterfat and licanic acid, as noted above, were given the ration plus 4 percent butterfat. The daily weight gain averaged 1.7 gm. on an intake of but 2.37 gm. of total solids, as compared with the lesser gain and the larger intake of the group receiving 2 percent butterfat and 2 percent licanic acid. These several results indicate that licanic acid possesses no apparent energy value, and under the conditions described may be slightly deleterious to the growth of young rats. Animals on the mineralized skim milk diet supplemented with 2 percent of butterfat lost some

sugar in the urine; with the supplement of 2 percent of butterfat plus 2 percent licanic acid this loss was not observed, indicating that the licanic acid "is capable, in the rat, of assisting in the utilization of lactose in milk." Fifty-nine references are given.

M. R. C. memorandum on bread (*Lancet* [London], 1940, II, No. 5, p. 148).—In this memorandum from the Accessory Food Factors Committee of the Lister Institute and the Medical Research Council concerning improvement in the nutritive value of bread to benefit the health of the people of Great Britain, it is recommended that (1) flour should be milled to 80-85 percent extraction instead of the existing 70 percent extraction, (2) the bleaching or improvement of flour by the use of oxidizing agents or by any other process which damages the nutritive value of the flour should be prohibited, (3) calcium salts should be added to flour and the bread made from flour thus supplemented should be specially designated, and (4) the use of baking powder which produces alkaline conditions should be strongly discouraged in making bread or biscuits. The reasons for these recommendations, together with possible disadvantages from increased extraction, are discussed.

Sugar tests on jams and preserves, D. K. TRESSLER (N. Y. State Expt Sta.). (*West. Canner and Packer*, 32 (1940), No. 10, pp. 29, 31).—Essentially noted from another source (E. S. R., 84, p. 547).

Essentials of nutrition, H. C. SHERMAN and C. S. LANFORD (New York: Macmillan Co., 1940, pp. X+418, figs. 34).—This text, offering a well-rounded and up-to-date view of the essentials of nutrition, is nontechnical in its presentation, assumes no prerequisite training in science, and is adaptable to various teaching needs. The subject matter considered, following an introductory chapter indicating the present position and the aims of the science of nutrition, deals with the energy aspects, the proteins and their amino acids, the mineral elements (Ca, P, Fe, and I), and the several vitamins. The final chapters discuss the relation of food to the teeth, nutritional characteristics of the chief types of foods, food costs and values, and the effective application of nutritional knowledge. Exercises and suggested readings accompany each chapter, and the appendix includes fairly extensive tables on the mineral, vitamin, and proximate constituents of foods, information on the fatty acids in foods, a list of the digestive enzymes and their origins and actions, a list of the principal acids of typical fruits, a glossary of terms, and brief summaries with regard to simple statistical treatment of nutritional data and the planning of diets in terms of 12 food groups.

Recent findings in nutrition, I-III, J. E. BECKER (*Med. Woman's Jour.*, 47 (1940), Nos. 3, pp. 80-84, XI; 4, pp. 115-122; [5], pp. 140-143).—An address discussing progress in vitamin research, essentially noted (E. S. R., 83, p. 415), and in research on the physiological significance of the minerals and the needs of the body for these inorganic elements. Tables on vitamin requirements and vitamin values of various food groups by Munsell (E. S. R., 83, p. 130), used in discussion of the paper, are included.

The cost of the special diet, R. OKEY. (Univ. Calif.). (*Med. Woman's Jour.*, 47 (1940), No. 12, pp. 366-370).—Practical suggestions to the dietitian, but also useful to all meal planners concerned with food costs, are given on the nutritive equivalents of foods showing seasonal or other price variations, and on the unlike contributions of certain foods commonly grouped together in dietary recommendations. Illustrative tables are given for both.

[Nutrition studies by the West Virginia Station] (*West Virginia Sta. Bul.* 298 (1940), pp. 27-28).—Progress reports are given on studies by H. Cameron of the nutritional status, particularly with respect to blood values, of university

students, and by Cameron and G. S. Dadds on the histology of bone growth in the healing of rickets in rats.

Phosphorus in human and animal health, T. S. HAMILTON. (Univ. Ill.). (*Amer. Fert.*, 94 (1941), Nos. 1, pp. 5-8, 26; 2, pp. 9-11, 20, 22, 24).—A discussion of the essentiality and sources of phosphorus for vital functions and parts of the animal body.

Medical evaluation of nutritional status.—I, Methods used in a survey of high school students, H. D. KRUSE, C. E. PALMER, W. SCHMIDT, and D. G. WIEHL. (Cornell Univ. et al.). (*Milbank Mem. Fund Quart.*, 18 (1940), No. 3, pp. 257-298, figs. 7).—This is the first of a series of papers reporting a cooperative investigation by the Cornell University Medical School, the Milbank Memorial Fund, The New York City Department of Health, and the U. S. Public Health Service of methods for appraising the nutritional status of apparently well persons for the purpose of selecting the most satisfactory tests and procedures for a system of examination adaptable to mass nutrition surveys. Certain limitations in the approach to the nutrition problem through dietary surveys as well as through anthropometric measurements and the estimates of physicians are discussed, and the advantages to be derived from the extensive operation of a satisfactory system of examination are listed preliminary to the description of the plan of the investigation.

The sample studied consisted of about 2,000 students of a senior high school in a predominantly low-income area on the lower east side of New York City and for purposes of comparison students of a private school in the city comprised of children from a relatively high-income group. The examination and specific tests applied to each individual are described in some detail. In addition to the customary medical, physical, and dental examinations and dietary histories, the tests included certain anthropometric measurements; roentgenograms; electrocardiogram; stethogram; adaptometer tests; Snellen test; biomicroscopic eye examination with the slit lamp; capillary resistance; neuromuscular response to galvanic stimuli; nerve accommodation; red blood cell count and volume; white blood cell count; differential count; sedimentation rate; Mantoux test; ascorbic acid in blood plasma; calcium, phosphatase, and phosphorus in blood serum; hemoglobin in whole blood; qualitative tests for albumin and sugar in urine and serological tests for syphilis. Numerous references to the literature and copies of various record forms used in the survey are appended.

Nutritional balance in pregnancy, S. J. COWELL (*Jour. Roy. Inst. Pub. Health and Hyg.*, 3 (1940), No. 4, pp. 102-110).—The term balance is used in this address in the sense of (1) equilibrium between intake and output, (2) interrelationships among different constituents, and (3) the balance between the maternal and fetal organism. The requirements during pregnancy of nitrogen, calcium, iron, and vitamins A, B₁, and C are discussed with reference to one or more of these types of balance.

Change in body-weight and food consumption of rats on repeated feeding of a deficiency diet, J. H. KELLERMANN (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 13 (1939), No. 1, pp. 201-216, figs. 6).—Rats placed on diets deficient in minerals and vitamins; minerals, vitamins, and bulk; and proteins until there was significant loss in weight followed by the restoration of the nutrient condition of the animals by a second diet did not lose weight more rapidly when again placed on deficient diets. In fact, there was slightly less weight lost during the second deficient feeding period than in the first, and the food intake did not differ appreciably. The findings thus differ from those of L. R. French and A. L. Bloomfield.*

* *Jour. Nutr.*, 14 (1937), No. 2, pp. 117-129, figs. 8.

The diagnosis and treatment of nutritional deficiency, A. P. MLIKLEJOHN (*New England Jour. Med.*, 222 (1940), No. 18, pp. 760-765).—The purpose of this report, as stated by the author, "is to summarize the more valuable clinical criteria by which nutritional deficiency can be recognized, with the hope that it may help to define more clearly the various conditions in which adequate nutritional therapy can be expected to achieve results." The various predisposing conditions are first summarized as: a restricted or unbalanced diet, defective absorption of food, increased dietary requirements, and defective utilization. It is also emphasized that a deficiency of a single dietary factor is very rarely encountered in clinical medicine, and that since most deficiencies are multiple adequate treatment requires the administration of a combination of dietary essentials.

Some of the outstanding features in the history, physical examination, laboratory tests, and treatments which may be of value in establishing a diagnosis of nutritional deficiency are then outlined. In conclusion it is noted that "in the absence of a definite diagnosis of deficiency, it is unwise to expect that the administration of concentrated preparations of vitamins will result in any benefit, except possibly some psychological improvement through suggestion."

Round table discussion on food allergy in children, B. RATNER ET AL. (*Jour. Ped.*, 16 (1940), No. 5, pp. 653-672).—Papers presented preliminary to general discussion at this round table, held at the 1939 meeting of the American Academy of Pediatrics, include the following: Modes of Acquisition, by B. Ratner; Diagnosis, by L. W. Hill; Prevention of Food Allergy, by H. H. Donnelly; Definition of Allergenicallly Denatured Foods, by B. Ratner; Infant Feeding in the First Year in Relation to Allergy, by L. W. Hill; and Feeding After First Year in Relation to Allergy, by H. H. Donnelly.

Effect of gelatin on power of women to perform maximal anaerobic work, F. A. HELLEBRANDT, R. RORR, and E. BREGDON. (Univ. Wis.). (*Soc. Expt. Biol. and Med. Proc.* 43 (1940), No. 4, pp. 629-634, figs. 3).—Six young adult women accustomed to severe physical activity rode to exhaustion on an electrodynamic brake bicycle ergometer equipped with a graphic voltmeter to record the rate of working and the speed of pedaling; these two factors were kept constant so that duration of exercise was the independent variable. After a preliminary period of training varying in length in the different subjects, gelatin (60 gm. daily) was added to the diet. The results, presented graphically (work in watt-minutes plotted against time in days) for the training period and the gelatin and post-gelatin periods, showed that the gelatin had no effect on the capacity of the women to perform maximum anaerobic work nor any apparent effect upon the improvement in power due to training. The "staleness" which developed as the extremely severe work was repeated daily was not prevented by the gelatin. Comparison of the published data of Ray et al. (*E. S. R.*, 81, p. 306) with the present experiments suggests that the increase in work output attributed by the earlier workers to gelatin may have been a training effect.

Effects of naringin and hesperidin on albino rats, R. H. WILSON and F. DEEDS. (U. S. D. A. et al.). (*Food Res.*, 5 (1940), No. 1, pp. 89-92, fig. 1).—Naringin and hesperidin, glucosides present in grapefruit and oranges, respectively, were fed for a period of 200 days to male albino rats without apparent cumulative injurious effect or hypoglycemic action. The glucoside in pure crystalline form was mixed with the stock diet at levels from 0.0625 to 1.0 percent, and from 6 to 8 rats weighing 50 gm. at the start of the experiment were used for each dosage tested. The growth of all test animals was comparable to that of controls receiving no glucosides, blood sugar levels were normal, and all organs showed weights within the normal range as well as normal macroscopic and microscopic appearances.

Blood sugar levels in rats receiving the cataractogenic sugars galactose and xylose, W. J. DABBY and P. L. DAY. (Univ. Ark.). (*Jour. Biol. Chem.*, 138 (1940), No. 2, pp. 503-509, fig. 1).—In extension of the study in which xylose was found to be as effective as galactose in producing cataracts in rats (E. S. R., 83, p. 573), confirmative data are presented. The results are also reported of frequent sugar determinations by a modification of the Folin-Malmos method permitting the use of samples as small as 0.025 cc. The animals receiving xylose or galactose gave blood sugar values considerably higher than those receiving glucose, fructose, mannose, and arabinose, but there was no direct relation between the times of onset of cataract and the degree of hyperglycemia. It is noted that both xylose and galactose are derivatives of *d*-threose and the other sugars of *d*-erythrose.

Influence of fluid and of evaporated milk on mineral and nitrogen metabolism of growing children, H. J. SOUDERS, H. A. HUNSCHER, F. C. HUMMEL, and I. G. MACY (*Amer. Jour. Diseases Children*, 58 (1940), No. 3, pp. 529-539, fig. 1).—Three average healthy children 3½-6 yr. of age served as subjects of the metabolic study in which they were first adjusted to a rigidly controlled regime before initiation of the first experimental period. During the first period 400 gm. of plain fluid milk were ingested, in addition to the basal diet conforming with accepted nutritive standards, for 25-40 consecutive days. During the next 20-25 days 400 gm. of diluted (1:1) evaporated milk was substituted for the fluid milk in each child's diet. For the next 25 days irradiated evaporated milk replaced the plain evaporated milk, the daily vitamin D supplement thus furnished amounting to 90 U. S. P. units per day per child. The values for caloric intake and for the average daily intakes and retentions of fat, nitrogen, and the acid-base minerals (Ca, Mg, Na, K, P, S, and Cl) per kilogram of body weight are tabulated to show the results for each child in each period.

When evaporated milk was substituted for fluid milk there appeared to be added impetus to the formation of soft tissue as judged by parallel increases in retention of nitrogen, sulfur, and potassium, unaccompanied by increases in retention of other elements. The irradiated evaporated milk apparently effected a more rapid and stable rate of bone formation, as indicated by the increased Ca:P ratios of the retentions, the higher levels and more consistent trends of the acid-base balances, and the increase in rate of gain of recumbent length.

Factors influencing appearance of centers of ossification during early childhood.—II, A comparative study of degree of epiphyseal ossification in infancy under varying conditions of diet and health, U. C. FRANCOIS (*Amer. Jour. Diseases Children*, 59 (1940), No. 5, pp. 1006-1012).—This paper, in continuation of previous work,⁹ presents the results of a study of epiphyseal ossification in four groups of infants. These include 50 breast-fed infants who received vitamin supplements, but no mineral supplement except in a few cases for a limited time; 50 infants who were nonbreast-fed and who received mineral supplements, together with vitamin additions; 50 infants, some breast-fed, others not, nearly all of whom received supplemental feedings, and all of whom showed evidence during the first year of some difficulty in intestinal adjustment; and a fourth group of 33 children on whom measurements and observations were made only after death. The children in the first three groups were examined at 3, 6, 9, and 12 mo. of age, at which time roentgenograms were taken of a number of epiphyseal ossification centers, length and weight were determined, and skeletal maturity and psychomotor progress in months were rated.

The results indicated that epiphyseal ossification was a more delicate indicator of constitutional health than progress in height or weight. Gastro-

⁹ *Amer. Jour. Diseases Children*, 57 (1939), No. 4, pp. 817-830, figs. 13.

intestinal sensitivity did not retard growth in length, but did tend to retard epiphyseal ossification. Among the healthy children, those receiving the mineral supplement showed more epiphyses ossified by the twelfth month than those in the other groups, while the children dead from severe illness showed the greatest retardation in epiphyseal ossification. The advance in precocity of the female child over the male child in epiphyseal ossification was observed in the healthy children but not in those who had suffered prolonged illness.

The influence of lactose on calcium retention in children, R. MILLS, H. BREITER, E. KEMPSTER, B. McKEY, M. PICKENS, and J. OUTHOUSE. (Univ. Ill.). (*Jour. Nutr.*, 20 (1940), No. 5, pp. 467-476).—The ability of lactose to influence the retention of calcium was studied in five small boys from 5 to 7 yr. of age. Calcium balances were determined through two periods, in the first of which, the nonlactose period of 13-16 weeks, the children were fed a basal dietary supplemented with CaHPO_4 (supplying 126 and later, 176 mg. of Ca) sufficient to bring the total calcium intake to about 500 mg. daily. Vitamin D was also fed. For the individual children the retentions averaged 131, 137, 103, 83, and 69 mg. per day, these amounting to 26.6, 26.5, 20.1, 16.2, and 14.0 percent of the individual intakes, respectively; the average for the group was 20.7 percent. In the second or lactose period, lasting for 6-9 consecutive weeks, an additional supplement of lactose (36 gm. daily) was given. During this period the individual retentions for the children, noted in the same order as above, averaged 151, 146, 111, 160, and 109 mg. per day; these amounts represented, respectively, 29.3, 29.4, 21.5, 30.6, and 21.1 percent of the intakes, the average being 26.4 percent. These values for the lactose period, higher in every case than the corresponding values in the nonlactose period, constituted gains in retention (expressed as percentage increase of the percent of calcium retained) of 10.2, 10.9, 7.0, 88.9, and 50.7 percent, the average being 33.5 percent.

It was observed that the average losses in urinary calcium amounted to 16.9 and 12.0 percent of the intake during the control and lactose periods, respectively, a decrease of 29 percent during the latter period. These findings suggest that the increased retention due to the lactose ingestion was effected through a decrease in the calcium lost by way of the kidney.

The utilization of the calcium of dicalcium phosphate by children, E. KEMPSTER, H. BREITER, R. MILLS, B. McKEY, M. BEARDS, and J. OUTHOUSE. (Univ. Ill.). (*Jour. Nutr.*, 20 (1940), No. 3, pp. 279-287, fig. 1).—Calcium metabolism experiments were conducted on six preschool boys $3\frac{1}{2}$ - $6\frac{1}{2}$ yr. of age. They received daily 500 mg. of calcium, 126 mg. of this total intake being fed as CaHPO_4 and the remainder being furnished by the basal diet. After 6 weeks, when the percentage utilization of calcium at this level had been established, the CaHPO_4 supplement was withdrawn, and the utilization of the calcium on the basal diet alone (furnishing 350 mg. of calcium daily) was observed. The difference between the calcium retentions at the two levels of intake calculated as percentage of the difference in intakes at the two levels gave thus a measure of the utilization of the calcium from the supplement of CaHPO_4 . Thus calculated, the utilization of calcium averaged 19.5 percent; individual values were 16.8, 17.9, 23.0, 19.5, 22.6, and 17.3 percent. These same children had previously served as subjects in a study of the availability of milk calcium and had been able to utilize only 19.8 percent of that calcium (E. S. R., 82, p. 133). It is concluded, therefore, that the dicalcium phosphate is not superior to milk as a source of calcium for children, and that except for the person who is allergic to milk there is little virtue in recommending the replacement of milk in the diet by dicalcium phosphate.

Retention of calcium in the diet by children, J. OUTHOUSE (In *Dairy Manufacturers Conference Manual, Department of Dairy Husbandry, University of*

Illinois, Urbana, Illinois, November 13-17, 1939. Urbana: Ill. Univ., 1939, pp. 143-146).—Studies on the calcium requirements of preschool girls (E. S. R., 82, p. 132) and boys (noted above) reported in detail elsewhere are here summarized briefly. It is concluded from these findings that within the age range of 2½-6½ yr. the well-nourished normally growing child can secure all the calcium he needs when 1 pt. of milk daily is added to an otherwise adequate dietary. It is pointed out that the older child, particularly during the period of rapid growth, should have a much larger quantity of milk, probably as much as 1½-2 qt. daily.

Calcium and phosphorus content of the blood of normal and mentally diseased men, G. H. SATTERFIELD, W. S. MCKIMMON, A. D. HOLMES, and I. TRIPP. (Univ. N. C. et al.). (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 2, pp. 117-123).—Calcium in the blood of 20 college men who served as normal controls averaged 10.65 mg. per 100 cc. of serum, with a range from 9.50 to 12 mg.; phosphorus averaged 3.93 mg., with a range from 3.33 to 4.83 mg. per 100 cc. of serum. In 96 patients with various mental deficiencies, the serum calcium averaged 10.20 mg. and the phosphorus 3.68 mg. per 100 cc. Only 6 of the subjects had a blood calcium content outside the normal limits of from 9 to 12 mg. per 100 cc. and of these 3 were slightly above the maximum and 3 slightly below the minimum limit. In 6 other subjects phosphorus levels slightly exceeded the maximum normal limit. Since abnormal calcium values did not accompany abnormal phosphorus values, the Ca × P product was within the normal range in all cases. Hence, the calcium and phosphorus content of the blood of nearly all of the patients with various types of mental diseases was found to be within normal limits.

Calcium and phosphorus metabolism in rats and dogs as influenced by the ingestion of mineral oil, M. C. SMITH and H. SPECTOR. (Ariz. Expt. Sta.). (*Jour. Nutr.*, 20 (1940), No. 1, pp. 19-30).—In one series of experiments rachitic lesions were induced in young rats by feeding the Steenbock rachitogenic cereal ration No. 2965. The ability of vitamin D, fed separately as cod-liver oil, to calcify these lesions was then observed in the absence of mineral oil and in its presence as incorporated in the basal ration at 5- and 10-percent levels. The "line test" findings indicated that mineral oil ingestion interfered with the utilization of the vitamin D. Three times as much cod-liver oil was necessary to heal rachitic lesions where the basal ration contained 5 percent of mineral oil as was needed in the absence of mineral oil; from 5 to 10 times as much cod-liver oil was needed when 10 percent of mineral oil was incorporated in the basal ration.

In other experiments the retention of calcium and phosphorus in mineral oil- and nonmineral oil-fed puppies was observed in a series of weekly balance studies. These showed that the mineral oil ingestion seriously interfered with the retention of both calcium and phosphorus. Moreover, the dogs fed the mineral oil developed characteristics of severe rickets even though they received adequate amounts of calcium and phosphorus and a supposedly minimum protective dose of cod-liver oil. In the dog receiving the ration containing 10 percent of mineral oil, optimum retention of the mineral elements did not occur even though the amount of cod-liver oil was increased fivefold.

The nomenclature of the vitamins, G. ADAMS. [U. S. D. A.]. (*Jour. Home Econ.*, 32 (1940), No. 5, pp. 314, 315).—This is a very brief presentation of the developments in vitamin nomenclature, with indication as to the relationship between various terms.

Vitamins and their occurrence in foods, H. E. MUNSELL (*Milbank Mem. Fund Quart.*, 18 (1940), No. 4, pp. 311-344).—This report, available as a reprint, constitutes a practical handbook of up-to-date information on the properties,

food sources, and factors affecting the stability of vitamins A, B₁ (thiamin), C (ascorbic acid), D, G (riboflavin), nicotinic acid (pellagra-preventive factor), and E, and on the properties and food sources of vitamin K (the anti-hemorrhagic vitamin) and vitamin B₆ (pyridoxin); a few practical rules to remember in the selection and preparation of foods for a diet adequate in vitamin content; a discussion of methods of determining vitamin values, with definitions of the International Units already adopted and suggested interrelationships between Sherman and International Units; a table of vitamin values arbitrarily selected as most representative of the foods considered; and the previously published (E. S. R., 83, p. 130) table of values suggested as expressive of the daily requirements of vitamins A, B₁, C, D, and riboflavin.

Vitamins for war (*Jour. Amer. Med. Assoc.*, 115 (1940), No. 14, pp. 1198, 1199).—In this editorial comment attention is called to the recent action of England in the compulsory fortification of margarine with vitamin A and of flour with calcium and vitamin B₁. As evidence of the need in this country of increased consumption of these factors, particularly vitamin B₁, the reports are cited of Stiebeling and Phipard (E. S. R., 81, p. 142) showing the inadequacy of a large proportion of diets in this factor and of Williams et al. on the effects of induced vitamin B₁ deficiency in man and the benefits of a liberal intake (E. S. R., 82, p. 852). These reports suggest that "efficiency for prosecution of a war can be increased by the simple expedient of providing a very little more vitamin B₁ than the public is receiving. This subject is also receiving consideration by those responsible for our national defense."

Whey as a source of vitamins and vitamin products, G. C. SUPPLEE (*Indus. and Engin. Chem.*, 52 (1940), No. 2, pp. 238-240).—This review, presented as an address, indicates that "eight successive generations of white rats have been maintained with a normal life cycle on a restricted experimental diet in which the whey vitamin fraction supplemented with rice polish served as the sole source of all vitamins except the fat-soluble factors carried by a small percentage of cod-liver oil."

Does quick freezing of meat affect its vitamins? (*South Dakota Sta. Rpt.* 1940, p. 68).—A progress report of work by L. M. Burrill and E. M. Pierson (E. S. R., 82, p. 707).

Determination of carotene in fresh and frozen vegetables.—I, Carotene content of green snap beans and sweet corn, W. I. ZIMMERMAN, D. K. TRENNLER, and L. A. MAYNARD. (N. Y. State Expt. Sta. coop. Cornell Univ.). (*Food Res.*, 5 (1940), No. 1, pp. 93-101).—The procedure described for the estimation of carotene in plant tissue is a modification of the method of W. C. Russell et al.¹ The first modification consists in extraction of the pigment by heating the plant material in acetone. This permits rapid extraction without loss of carotene due to enzymic action, facilitates filtration, and decreases the tendency toward emulsion formation during subsequent analysis. A second modification, devised to remove noncarotenoid pigments, consists in successive extractions of the petroleum ether solution of the pigments with 89 percent methyl alcohol, 25 percent KOH in methyl alcohol, and large portions of diacetone. Xanthophyll, chlorophyll, and other noncarotenoids are removed by these treatments, permitting the carotene in the washed, dried petroleum ether solution of definite volume to be determined colorimetrically with pure β -carotene as a standard. Estimations by this method of the carotene in green beans and in Golden Bantam corn were confirmed in general by biological assays for vitamin A, the U. S. P. XI method being employed and the vege-

¹ *Plant Physiol.*, 10 (1935), No. 2, pp. 325-340, figs. 2.

tables being fed at levels sufficient to furnish, respectively, 0.6 and 1.2 $\mu\text{g.}$ of carotene.

Results indicated that from 50 to 60 percent of the pigment of Golden Bantam corn is not carotene. By analysis from 0.9 γ to 1.1 γ of carotene per gram of fresh material was found present in the frozen corn and from 2.1 γ to 2.2 γ in the frozen green beans. The amounts were not decreased upon storage of the frozen samples for 3-4 mo. at 0 and -40°F. It was observed in the biological analyses that increasing levels of cod-liver oil gave better growth response than correspondingly increasing levels of β -carotene, and that groups receiving quantities of vegetables sufficient to furnish 0.6 $\mu\text{g.}$ of carotene (1 International Unit) per day showed greater variation in average growth response than groups receiving vegetable supplements equivalent to 1.2 $\mu\text{g.}$ (2 I. U.) of carotene.

The carotene and vitamin A content of market milks, A. C. DORNBUS, W. H. PETERSON, and F. R. OLSON. (Wis. Expt. Sta.). (*Jour. Amer. Med. Assoc.*, 114 (1940), No. 18, pp. 1748-1751, figs. 4; abs. in *Milk Plant Mo.*, 29 (1940), No. 6, pp. 66, 67).—Four types of commercial milks marketed by eight large distributors in the Madison and Milwaukee areas of Wisconsin were examined monthly for carotene and vitamin A content, these constituents being determined on the nonsaponifiable fraction of the butterfat by a photometric procedure. The value $E_{1\text{cm}}^{1\%} = 328 \text{ m}\mu = 1,000$ was used in the calculation of vitamin A. Monthly variations in vitamin A and carotene contents, expressed as micrograms per gram of butterfat, are shown by graph for the market (mainly Holstein), Guernsey, and certified milks. Vitamin D milks were similar to market milks, since the breeds and rations used for the production of the two types are usually the same. All milks showed marked seasonal changes in both carotene and vitamin A contents, the variations for carotene being greater than for vitamin A. The milks were fairly similar in vitamin potency per gram of butterfat, although certified milks were somewhat higher than the other milks during the late winter months (probably because feeds of better quality were used), and Guernsey, because of its higher fat content, had a higher potency on the fluid basis than the others. Per quart the winter milks (January to April) averaged 1,088, 1,241, and 1,334 U. S. P. units for market, Guernsey, and certified milks, respectively, while summer milks (June to October) gave corresponding averages of 1,906, 2,415, and 1,995 U. S. P. units.

Influence of liquid petrolatum on the blood content of carotene in human beings, A. C. CURTIS and E. M. KLINE (*Arch. Int. Med.*, 63 (1939), No. 1, pp. 54-63 figs. 7).—Observations of the effect in man of liquid petrolatum ingested in varying amounts and at different times of day on the absorption of carotene from the gastrointestinal tract as measured by blood carotene levels are reported. The conclusion is drawn that liquid petrolatum administered in amounts of 20 cc. twice or three times a day before meals or mixed with carotene dissolved in cottonseed oil prevents complete absorption of the carotene, but that there is little, if any, effect on the blood carotene if the liquid petrolatum is given in a single dose of 30 cc. at bedtime.

Further evidence of a new factor in the B complex, W. R. WYATT and V. E. NELSON. (Iowa State Col.). (*Iowa Acad. Sci. Proc.*, 46 (1939), pp. 203-206).—A further study of the SB factor of the vitamin B complex (E. S. R., 81, p. 311), is reported. The conclusions drawn in the earlier study are confirmed. In addition evidence is presented leading to the conclusion that the deficiency resulting from absence of this factor is also distinct from that of deficiency in unsaturated fatty acids, and that the factor is not identical with the spectacled eye factor, antihemorrhagic factor, and chondroitin sulfuric acid.

Reproduction in rats on synthetic B-complex supplement, T. H. JUKES. (Univ. Calif.). (*Soc. Expt. Biol. and Med. Proc.*, 45 (1940), No. 2, pp. 625-627).—

Reproduction, although not as successful as on a normal diet of natural foods, and rearing of healthy representatives of a second generation is reported for rats on a diet in which all of the water-soluble factors were in the synthetic form and were fed at levels thought to be more than sufficient in each case. Reproduction occurred when the females on the diet were mated to males from stock and also when mated to males which had been on the experimental diet from weaning. There were some resorptions and complete failure to suckle the young when pantothenic acid was removed from the diet.

Effects of a supplement of vitamin B (adsorbate) on the growth of infants, M. R. PRICE (*Brit. Med. Jour.*, No. 4150 (1940), pp. 80-82).—A daily supplement of 100 International Units (300 γ) of vitamin B₁ in the form of a tablet of kaolin adsorbate from a natural source was administered to 50 infants (30 boys and 20 girls) selected at random from those brought to the child welfare clinic of the Royal Free Hospital. Any beneficial effect of the vitamin B₁ supplement was judged by monthly increases in weight and height increases over 4 mo. as compared with these changes in a control group (26 boys and 25 girls likewise selected at random) not receiving the supplement. The results, analyzed for significance, indicate that for boys the figures may be regarded as significant, although they are merely suggestive for the girls. "Taking both sexes, together, however, it can be asserted that there is a 100 to 1 probability that the greater rate of growth of the treated group is significant. The figures for weight do not carry the same degree of certainty. . . . From these considerations and from the clinical results recorded, it, therefore, appears probable that supplements of vitamin B₁ derived from natural sources and providing not less than 100 units daily can usefully be given to infants whose progress is unsatisfactory."

The story of vitamin B₁ (thiamine hydrochloride U. S. P.), C. R. ADDINALL (*Rahway, N. J.: Merck & Co., 1940, rev. ed., pp. 72, figs. 18*).—In this revision (*E. S. R.*, 80, p. 710) the review of the literature has been brought up to date and new topics have been added on clinical manifestations and therapy of vitamin B₁ deficiency and vitamin B₁ in plant growth. Numerous references through 1939 are given at the end of each section.

The influence of exercise on the growing rat in the presence and absence of vitamin B₁, N. B. GUERRANT and R. A. DUTCHER. (*Pa. Expt. Sta.*). (*Jour. Nutr.*, 20 (1940), No. 6, pp. 589-598, figs. 5).—Employing methods used for studying the relation of exercise to vitamin A consumption (*E. S. R.*, 81, p. 557), the authors depleted two groups of rats on a vitamin B₁-deficient diet until paralytic symptoms developed. Following this, 6 μ g. of vitamin B₁ was fed to each rat per day. Controls received this supplement throughout the experiment. Those in the forced exercise group were unable to perform the 1,000 cage revolutions per day. It was noted that the activity of the depleted rats was greater than that of the controls during the first few weeks, but the depleted rats became progressively less active as the paralytic symptoms were more fully developed. Such animals became progressively less active for several days after supplementary feeding of 6 μ g. of thiamin per day was begun. The group with voluntary exercise gained less weight than those undergoing forced exercise or those in confinement. Likewise, those permitted voluntary exercise lost a greater percentage of their weight before developing paralytic symptoms than the other groups. The findings indicate that the vitamin B₁ requirements are increased with physical exercise. In rats receiving no vitamin B₁ there was less food consumption, less growth, early development of paralytic symptoms, and the elimination of a greater number of fecal particles with increased exercise than in the other groups.

The therapy of the Cook County Hospital: The therapy of subvitaminosis B₁. B. FANTUS, E. F. TRAUT, and R. S. GREENBAUM (*Jour. Amer. Med. Assoc.*, 115 (1940), No. 6, pp. 450-454).—Subvitaminosis B₁, defined as a peripheral neuropathy produced by vitamin B₁ deficiency, is used synonymously with beriberi and thiamin deficiency. The conditions in which it must be suspected are summarized as inadequate intake of foods containing vitamin B₁, inadequate absorption, disturbed utilization, and disturbed distribution. The symptoms and signs of early, moderately advanced, and advanced subvitaminosis B₁ are described, together with a brief listing of certain conditions sometimes attributed to, but less generally accepted as due to, subvitaminosis B₁. It is considered that at present the diagnosis of this condition must be based upon symptoms and physical signs until a satisfactory chemical method for determining thiamin absorption and utilization can be found for clinical use. Prophylactic and therapeutic measures are discussed, including treatment of associated conditions.

Vitamin B₁ requirements of the average adult are given as from 1 to 1.5 mg., or from 300 to 450 International Units of thiamin hydrochloride daily, depending upon the nonfat caloric intake, or from 10 to 15 I. U. per 100 calories consumed on the assumption that the average diet furnishes 3,000 calories; for the pre-school child, at least from 20 to 25 I. U. per 100 calories; and for pregnant or lactating women, about 50 I. U. per 100 calories or 1,500 I. U. (5 mg.) daily. "To obtain an adequate amount of thiamin an adult should have daily at least 1 pt. (500 cc.) of milk, one or two eggs, at least one serving of meat, two servings of fruit (one raw), two servings of vegetables (one a legume), nuts, and whole-grain bread and cereals."

Peripheral neuropathy due to vitamin B₁ deficiency in diabetes mellitus. H. D. FEIN, E. P. RALLI, and N. JOLLIFFE (*Jour. Amer. Med. Assoc.*, 115 (1940). No. 23, pp. 1973-1976).—Among 422 ambulant diabetic patients, 9 developed a symmetrical peripheral neuropathy characteristic of the peripheral neuropathy found in subjects with proved vitamin B₁ deficiency. Treatment by oral administration of 10 mg. of thiamin daily, with no other change, resulted in the cure of 8 subjects and improvement in the ninth. The development of this condition is attributed to a diet of borderline adequacy in vitamin B₁ through substitution of foods poor in vitamin B₁ for prescribed foods of equivalent carbohydrate and calcium values, but richer in vitamin B₁.

Treatment of multiple sclerosis with nicotinic acid and vitamin B₁.—Preliminary report, M. T. MOORE (*Arch. Int. Med.*, 65 (1940), No. 1, pp. 1-18, figs. 7).—Favorable results are reported, with detailed case histories, in the treatment of five cases of advanced multiple sclerosis parenterally with nicotinic acid and vitamin B₁. Doses of nicotine acid as large as 120 mg. and thiamin chloride, 32.2 mg., were given for prolonged periods without harmful effects. Although complete remissions were not secured in any of the cases reported, every patient noted improvement in bodily movements. Evidence is presented, both in the rise of cerebrospinal fluid pressure in the subjects during the period of flushing of the skin and in photographs showing visualization of dilated vessels and increased capillary filling in the brain and spinal cord of the cat under similar treatment, leading to the conclusion that nicotinic acid produces vaso-dilatation and increased blood flow in the brain and spinal cord.

Wernicke's disease: Identity of lesions produced experimentally by B₁ avitaminosis in pigeons with hemorrhagic polioencephalitis occurring in chronic alcoholism in man. L. ALEXANDER (*Amer. Jour. Pathol.*, 16 (1940), No. 1, pp. 1-70, pls. 13, fig. 1).—Evidence is presented establishing the identity in topographical distribution and in morphological and histological characteristics of the lesions of Wernicke's hemorrhagic polioencephalitis in man and lesions produced experimentally in pigeons by a diet deficiency in vitamin B₁, but

furnishing ample supplies of other vitamins (A, B₂, C, and D). It is noted that some of the lesions have been demonstrated by Prickett in rats (S. E. R., 72, p. 884) and that the earlier work of the author and associates on the production of Wernicke's disease in pigeons has been confirmed in the report of Zimmerman previously noted (E. S. R., 84, p. 704).

Relation of nicotinic acid to pellagra, C. A. ELVEHJEM. (Univ. Wis.). (*Physiol. Rev.*, 20 (1940), No. 2, pp. 249-271).—In this review the various steps leading up to the recognition of nicotinic acid as the antipellagra factor are traced chronologically, with an explanation in the light of later developments of some of the difficulties encountered in the earlier work. The relationship between respiratory enzymes and vitamins of the B group is emphasized, with the comment that studies on the constitution of pyridine coenzyme undoubtedly aided in the identification of nicotinic acid as the antipellagra factor. Discussion is included of the cozymase and nicotinic acid content of various tissues, of the nicotinic acid content of foods, and of studies on the urine during nicotinic acid deficiency. In conclusion, two important facts which apply not only to nicotinic acid but also to the vitamins in general are emphasized—(1) the importance of the experimental animal in extending knowledge of important nutritional factors and (2) the importance of recognizing the specificity of each of the individual vitamins. In discussing the first, attention is called to the fact that in the case of nicotinic acid the species of experimental animal used has been an important factor. The antipellagra factor was first distinguished from thiamin by rat experiments, then from riboflavin by the use of the chick, and finally from the chick antidermatitis factor by the use of the dog. In each case the identification of the factor has been followed by recognition of its indispensability for the human. Under the second point it is brought out that the full value of a single factor can be realized only when it is used with all of the other known essential factors. "Thus nicotinic acid will cure or prevent all conditions produced by a true nicotinic acid deficiency but can be of no value in the treatment of conditions produced by a deficiency of other factors, and its value in the treatment of pellagra is much more effective when all other factors are supplied in optimum amounts."

An extensive list of literature references is appended.

Relation of pantothenic acid to dermatitis of the rat, L. R. RICHARDSON and A. G. HOGAN. (Mo. Expt. Sta.). (*Soc. Expt. Biol. and Med. Proc.*, 44 (1940), No. 2, pp. 583-585).—In this preliminary note a comparison is reported of the effects of pantothenic acid or its sodium or calcium salt and vitamin B₆, alone or combined, on mild dermatitis produced in rats on a ration of casein 20, sucrose 71, cellulose 3, cod-liver oil 2, and salts 4 percent supplemented with 0.2 mg. of thiamin and 0.4 mg. of riboflavin per 100 gm. of food.

All of the 11 rats receiving vitamin B₆ without pantothenic acid improved, but 9 of them had a recurrence within an average of 15 days, the other 2 being continued for 12 and 30 days, respectively, without recurrence. The 2 animals becoming moribund on the vitamin B₆ supplement without pantothenic acid were cured in 15 and 16 days, respectively, by treatment with sodium pantothenate in doses of 70 μ g. daily. Of the 10 rats receiving either sodium or calcium pantothenate, 2 were cured although 1 showed mild recurrence later. Some of the others improved, but none made a complete recovery. The 5 rats receiving both vitamin B₆ and pantothenate recovered within a week and made considerable gains in weight.

The lesions produced by deficiency of the two vitamins separately were indistinguishable except for the eyes, which were said to be affected more severely in the pantothenic acid deficiency. "The lids adhere and are soon

covered by a large scab. If pantothenic acid is supplied in addition to vitamin B., at this stage the scab falls off, leaving a spectacled appearance which disappears without any additional treatment as the hair grows back in the denuded areas."

The vitamin C content of fruits and vegetables, R. C. BURRELL and V. R. EMBRIGHT. (Ohio State Univ.). (*Jour. Chem. Ed.*, 17 (1940), No. 4, pp. 180-182).—The vitamin C content of a large number of fresh fruits and vegetables was determined by titration with 2,6-dichlorophenolindophenol. The details concerning reagents and method are noted, and the values for the various samples are reported together with notations as to variety and whether the samples were from the market or freshly picked. Results on a few vegetables analyzed immediately before cooking and immediately afterward, with determinations on the cooking water as well as the cooked vegetables, indicated that a very considerable part of the cooking loss of vitamin C is due to discarding the cooking water.

The effect of cooking and storage on the ascorbic acid content of potatoes, L. A. ROLF. (U. S. D. A.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 5, pp. 381-395, figs. 2).—This study has been summarized by the author as follows:

"The vitamin C value of potatoes was found to depend more upon the time and temperature of storage than upon the method of cooking. Maine-grown Green Mountain and Irish Cobbler potatoes stored at 15.5° C. decreased in ascorbic acid content very rapidly during the first few weeks after harvesting and much more gradually thereafter. The Green Mountain potatoes decreased nearly 50 percent in ascorbic acid content in 5 mo. of storage, about 30 percent being lost during the first month. The decrease in the vitamin was more rapid at 4.5° than at 15.5° storage for both varieties. The maximum loss of ascorbic acid due to cooking Irish Cobbler potatoes stored at 15.5° never exceeded 25 percent. Steaming and boiling unpared tubers caused smallest losses. Baking and pressure cooking caused somewhat greater losses, while boiling pared potatoes was least conserving of the vitamin. The distribution of ascorbic acid in the potato tuber was not uniform, differed in the two varieties, and was affected by the temperature and the length of storage."

Capillary fragility and ascorbic acid studies, H. G. RAPAPORT, S. H. MILLER, and A. SIGULAR (*Jour. Ped.*, 16 (1940), No. 5, pp. 624-626).—In this comparison of the reliability of the capillary fragility and blood plasma ascorbic acid tests for vitamin C nutrition, the positive pressure technic, as described by Wright and Lilienfeld (*E. S. R.*, 77, p. 281), was used for measuring capillary fragility with the standard for normality as not more than 10 petechiae, and the method of Farmer and Abt for blood plasma with values from 0.7 to 2 mg. per 100 cc. as normal. The subjects comprised 150 children ranging in age from 5 to 13 yr., 41 of whom had signs of rheumatic disease. Of the entire number 60 gave values within the normal range in both tests; 32 normal blood plasma and positive or abnormal capillary fragility values; 41 subnormal blood plasma and normal capillary fragility values; and 17 subnormal blood plasma and positive capillary fragility values. The authors conclude that there appears to be no correlation between abnormal capillary fragility and avitaminosis C, but suggest the possibility that vitamin P may be the main factor responsible for the maintenance of the normal capillary wall.

Aspects of the function of vitamin E irrespective of its relation to the reproductive system, H. M. EVANS. (Univ. Calif.). (*Jour. Amer. Dietet. Assoc.*, 15 (1939), No. 10, pp. 869-874, fig. 1).—An address.

Effect of synthetic vitamin K compounds on prothrombin concentration in man, P. M. AGGELER, S. P. LUCIA, and L. GOLDMAN. (Univ. Calif.). (*Soc. Bact. Biol. and Med. Proc.*, 43 (1940), No. 4, pp. 689-694).—Twenty-six patients

with hypoprothrombinemia were variously treated with stated doses of phthiocol, 2-methyl-1,4-naphthoquinone, or 4-amino-2-methyl-naphthol-hydrochloride. The three compounds, of about the same relative effectiveness when considered in terms of the dosages employed, produced marked elevation in prothrombin concentration (from a range of 3-43 percent before treatment to 60-130 percent 24 hr. after treatment) in the 11 cases of obstructive jaundice; no elevation in 8 and only slight elevation in 3 patients with chronic diseases of the liver; no elevation in 1 patient and after initial delay slight elevation in another patient with acute liver disease; and moderate elevation in 2 patients with gastrointestinal diseases. No untoward reactions were observed except that injection of 4-amino-2-methyl-naphthol-hydrochloride produced a slight burning pain at the site of injection.

The effect of vitamin K on chicks with avitaminosis K due to diet or to experimental obstructive jaundice [trans. title], H. DAM and J. GLAVIND (*Ztschr. Vitaminforsch.*, 10 (1940), No. 1-2, pp. 71-79, figs. 4; *Fr., Eng. abs.*, pp. 78, 79).—For these experiments 330- to 400-gm. chicks were used, the control group receiving a synthetic basal diet devoid of vitamin K plus a supplement of alfalfa sufficient to furnish about 4 units of vitamin K per 100 gm. of feed. One test group of normal chicks received the basal diet without supplement, while another test group of chicks with bile-duct ligature received the basal diet and the supplement. Upon development of K avitaminosis, as judged by very low prothrombin activity of the blood (about 26-28 days after ligation in the one group), intravenous injections of vitamin K were administered. An emulsion of vitamin K concentrate from alfalfa or of synthetic vitamin K (*E. S. R.*, 82, p. 441) was used, the amounts injected varying from 0.05 to 50 units per gram of body weight. Prothrombin activity, determined at intervals after injection, was practically the same for all doses from 0.5 to 50 units 24 hr. after injection; maximum activity was reached, as indicated by the graphs, within the first or second day, and thereafter declined. The vitamin K, however, was "equally effective in raising the prothrombin content of the blood in chickens with avitaminosis K whether due to dietary restriction or induced by ligature of the bile duct."

Vitamin M, P. L. DAX. (*Univ. Ark.*). (*Natl. Livestock and Meat Bd. Rpt.*, 17 (1940), pp. 35, 36, 37, fig. 1).—This is a progress report on the isolation of vitamin M (*E. S. R.*, 81, p. 459) and the relation of a deficiency of this vitamin to susceptibility to bacillary dysentery.

Does citrin (vitamin P) occur in milk? [trans. title] W. NEUWELLER (*Ztschr. Vitaminforsch.*, 9 (1939), No. 4, pp. 338-342; *Fr., Eng. abs.*, p. 341).—The method employed for the detection of citrin involved treatment of the sample (2 cc. of milk or urine) with 5 cc. of silver acetate solution, followed by treatment of the supernatant fluid (remaining after centrifugation) with 5 cc. each of 5 percent sodium cyanide and 5 percent sodium carbonate solutions. The color development after 24 hr. was determined in the case of urine by direct reading in a step photometer (filter S 47), the concentration of citrin being read from a standard curve. With milk the color developed was compared with that obtained with standard milk samples containing known and graded amounts of citrin (eriodictyol).

Tests on many samples failed to detect citrin either in cow's milk or in breast milk even after intravenous administration of 50 mg. of citrin for 6 days. Injected citrin was found to be eliminated practically quantitatively in the urine. It is concluded, therefore, that citrin plays no important part as an activator of ascorbic acid.

The rôle of diet in the control of dental caries, J. D. BOYD (*Jour. Amer. Dent. Assoc.*, 27 (1940), No. 5, pp. 750-756, figs. 3).—This report, presented as an address, is based on a statistical study of the records of about 250 children

observed repeatedly through hospital attendance over periods of months or years. About 80 percent of these were living under quantitatively prescribed dietary regimens, which consistently afforded liberal allowances of milk, eggs, vegetables, and fruits and included cod-liver oil. The various dietaries differed widely, however, in consistency, in the amount and nature of the carbohydrate component, and in fat content.

In the children under dietary control there was a predominant tendency for the exposed dentin in carious areas to harden within a few weeks or months after the dietary regimen was established and to show no further progress of decay as long as the regimen was followed. This was in contrast to the conditions in the children not receiving controlled diets. In this latter group the caries of affected teeth tended to progress rather than retrogress, and there was a marked increase in the tendency toward progressive caries in the teen age. Although there was some increase in caries at this age in the group under dietary control, the increase was less marked than in the uncontrolled group. Since adequate content of the protective factors was the most consistent characteristic of the various prescribed diets, it is considered that their influence in protecting the teeth can be attributed to the furtherance of complete and optimum nutrition, thereby offering the teeth full opportunity to resist destructive agencies.

The diabetic child: An analytic study of his development, G. D. BROWN and W. H. THOMPSON. (Univ. Minn.). (*Amer. Jour. Diseases Children*, 59 (1940), No. 2, pp. 238-254).—Data obtained from case studies and through individual interviews are presented for 60 juvenile diabetic patients considered typical of this population group in Minnesota. In age the patients ranged from 22 mo. to 20 yr. and 1 mo., all of the older members having had the onset of diabetes before 15 yr. of age. The group on the whole was as healthy as the nondiabetic siblings (except for acidosis and insulin reactions). Limited measurements revealed no consistent or peculiar deviations from the average in height, weight was not significantly below average except during the first 6 mo. of the disease, and the intelligence of the group showed no deviation from the average and no significant deviation from that of their sibling controls or from the average of Minnesota children. No characteristic abnormalities in personalities were discovered.

Vitamin A deficiency in diabetes mellitus, J. G. BRAZER and A. C. CURTIS (*Arch. Int. Med.*, 65 (1940), No. 1, pp. 90-105, figs. 6).—A group of 20 ambulatory young and early middle-aged patients with juvenile diabetes mellitus and a control group of the same number of normal subjects were given dark adaptation tests with the biophotometer according to the Jeans technic except that the readings were recorded in millifoot candles instead of as direct readings. Determinations were also made of blood carotene and blood cholesterol.

The control group gave biophotometer readings comparable to the normal values reported by other observers. Blood carotene values were somewhat higher than previously reported values, and blood cholesterol, averaging 200 mg. per 100 cc., agreed fairly well with the upper normal limits. The biophotometer readings of the diabetic patients, 3 of whom were subjectively aware of night blindness and 9 showed skin changes such as have been noted in vitamin A deficiency, were in the range definitely suggestive of vitamin A deficiency, although the blood carotene in all but 2 cases was considerably higher than the average of the normal group. Blood cholesterol averaged 239 mg. per 100 cc.

The daily administration of 60,000 U. S. P. units of vitamin A in the form of crystalline carotene dissolved in vegetable oil for as long a period as 14 days had no effect on the light adaptation in these subjects, but increased the already high blood carotene levels. The same intake of vitamin A administered in the

form of concentrated fish-liver oils produced significant improvement in the biophotometer readings, with light adaptation returning to normal or nearly normal in from 3 to 21 days. Removal of the vitamin A supplements after the readings had become normal resulted in prompt relapse to subnormal values. The changes in cholesterol values throughout the experiment were insignificant.

"The cause of poor light adaptation in patients with juvenile diabetes mellitus appears to be an inability to convert carotene to vitamin A."

Diet and resistance to tuberculosis, K. A. TISSUE (*Jour. Amer. Dietet. Assoc.*, 16 (1940), No. 4, pp. 313-324).—This paper is chiefly a review of the literature, with particular emphasis on vitamin A and C deficiencies and therapy in tuberculosis. A report is included of a study of the dietary records of 1,000 cases of the childhood type of tuberculosis. A deficiency of vitamin A was indicated in 63.1 percent and of vitamin C in 84.6 percent of the cases. Correction of these and other dietary deficiencies resulted in an improvement in the physical condition of the children. An increase in vitamin C and milk intake alone was followed by marked improvement in symptoms. A list of 78 references to the literature is appended.

TEXTILES AND CLOTHING

Textiles and clothing [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt.*, 1940, pp. 12-17).—This annual report (E. S. R., 82, p. 715) summarizes the work of the Division of Textiles and Clothing dealing with physical tests on women's full-fashioned hosiery knit from commercial cotton yarns; with finishing treatments and water repellency in the case of cotton hose (E. S. R., 84, p. 573); with fabric deterioration by micro-organisms (E. S. R., 83, p. 428); with wool substitutes; and with consumer buying guides.

Physical characteristics in cotton and their interrelationship (*Texas Sta. Rpt.* 1939, pp. 117-118).—This progress report summarizes findings by M. A. Grimes in extension of the study reported earlier (E. S. R., 82, p. 572) concerning the number of locks per boll, the quantity of fiber on the seed, and the length, uniformity, fineness, strength, and thickness of fibers of Lightning Express and Half and Half varieties of cotton and succeeding generations of hybrid lines resulting from a cross of these two varieties.

Surface characteristics of cotton fibers, as indicated by electrophoretic studies, A. M. SOOKNE and M. HARRIS (*Jour. Res. Natl. Bur. Standards [U. S.]*, 26 (1941), No. 1, pp. 65-69, fig. 1).—The pH mobility curve for cotton depectinized by treatment with a boiling 1-percent solution of sodium hydroxide for various periods showed a low order of acidity, that for pectic substance from cotton was characteristic of a highly acid substance, and the curve for dewaxed cotton appeared to be a composite of curves for cellulose and pectic substance. The purified cellulose exhibited a reversal of charge below pH 2.5 and accordingly was isoelectric at that pH. This reversal did not result from irreversible changes produced in the fiber during immersion in the dilute solutions of acid used.

Notes on the determination of the fibre fineness of a Merino wool sample, V. BOSMAN and C. M. VAN WYK (*Onderstepoort Jour. Vet. Sci. and Anim. Indus.*, 13 (1939), No. 2, pp. 401-413, fig. 1).—The described method consists in removing the grease from the wool sample with cold benzene, cutting the fibers into fragments, transferring to ether and then drying, and finally mounting on a slide in Euparal mounting medium. Close agreement was obtained in the mean fiber fineness of successive clumps of fiber fragments taken from the ether bath for mounting. Factors affecting the accuracy of the weight-length method for determining fiber fineness are discussed.

Addition of reworked wool decreases fabric strength (*South Dakota Sta. Rpt.* 1940, p. 67).—This progress report summarizes the results of laboratory phys-

ical and chemical tests by B. Bailey of fabrics of virgin and reworked wool before and after dry cleaning and pressing for 15, 30, and 45 times.

Accuracy of small wool samples for shrinkage tests (*Texas Sta. Rpt. 1939*, p. 50).—Results obtained in tests by S. P. Davis, J. M. Jones, and B. L. Warwick on fine short wools from 19 different flocks of sheep indicated that accurate shrinkage estimations of wool clips may be made by use of a correction factor in connection with shrinkage figures obtained on small samples taken from the wool clips at shearing.

HOME MANAGEMENT AND EQUIPMENT

Building national strength through home economics (*U. S. Dept. Agr., Sec. Agr. Rpt., 1940*, pp. 162-166).—This brief account of the work of the Bureau of Home Economics covers essentially the same points as noted elsewhere.

Economic studies [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1940*, pp. 2-7).—This report of the Division of Family Economics (E. S. R., 82, p. 717) considers the food consumption habits of families in small cities, villages, and farms, and points to many existing inadequacies as revealed by data from the consumer purchases study; the effect of the food stamp plan on the diets of low-income city families, as shown by a study in Dayton, Ohio, in 1939; and the status and needs of farm housing noted below.

Family housing and facilities: Five regions. Urban, village, farm, H. KYRK, D. MONROE, M. Y. PENNELL, and E. D. RAINBOTH (*U. S. Dept. Agr., Misc. Pub. 399 (1940)*, pp. VI+223, figs. 5).—This report, one of a series from the consumer purchases study, presents a description of the housing (number of rooms) and housing facilities (running hot and cold water, electric lights, central furnace, etc.) of native-born families living in 20 small cities, 140 villages, and 64 counties of 12 farm sections. Expenditures of these families for housing are to be discussed in another report constituting one of the group presenting details of expenditures for specific commodities.

The relationship of housing and housing facilities to such factors as income level, degree of urbanization, region (and therefore climate, culture, and other environmental conditions), composition of families (number and age of members), occupation, and tenure are discussed. A summary describing the housing of families at three economic levels concludes the report.

Family income and expenditures: Five regions.—II, Family expenditures. Urban and village series, D. S. BRADY, D. MONROE, E. PHELPS, and E. D. RAINBOTH (*U. S. Dept. Agr., Misc. Pub. 396 (1940)*, pp. III+410, figs. 13).—This is the seventh report (E. S. R., 84, p. 717) on family income and expenditures from the extensive study of consumer purchases. Dealing with expenditures, it constitutes part 2 of the urban and village report; part 1, dealing with income, was issued in four volumes covering the Southeast Region (E. S. R., 84, p. 420), the Middle Atlantic and North Central Region and the New England Region (E. S. R., 83, p. 861), the Plains and Mountain Region (E. S. R., 82, p. 287), and the Pacific Region (E. S. R., 81, p. 603). A similar series deals with income and expenditures of farm families.

The present report is concerned with the consumption patterns of families living in 140 villages and 20 small cities in different parts of the United States, the regions involved being the five dealt with in part 1 of the report. The distribution of total expenditures for farm family living in 15 major categories—food, clothing, housing, medical care, and the like—are analyzed, with special attention to variations associated with income, family composition, occupation, and region. The study is limited to families not on relief and in which both husband and wife are native-born. It is pointed out that the average income of

these families was higher than that of all the families in the communities and that this difference between the group studied and the total population must be recognized in the use of the expenditure data presented. The basic data used for the various analyses are presented in detail in the appendixes.

Housing and household equipment [at the Bureau of Home Economics] (*U. S. Dept. Agr., Bur. Home Econ. Rpt., 1940, pp. 17-19*).—This annual report (*E. S. R., 82, p. 717*) of the Division of Housing and Household Equipment summarizes the research pointed toward establishing minimum desirable standards for urban and rural homes for families of different sizes at different income levels; and the studies directed toward giving the homemaker facts to guide her in the extension of electric lines (*E. S. R., 84, p. 140*) and in the buying, use, and care of equipment, such as lighting appliances, electric roasters, irons, and refrigerators. It is noted that buying guides for various items of household equipment have been prepared.

The care and maintenance of wood floor finishes in the home, B. M. KUSCHKE (*Rhode Island Sta. Bul. 276 (1940), pp. 20, figs. 5*).—In this report of an investigation noted previously from progress reports (*E. S. R., 54, p. 141*) actual wear tests of a number of finishing materials applied to new oak and pine stair flooring and an old pine floor, both in institutional use, are summarized; an abrasion machine for accelerated wear tests, designed and constructed by E. I. Shock of the engineering school and further developed by other members of the school, is described and illustrated, with the technic for its use; and water-resistant tests for a number of finishes are given. A brief account of the early history of protective finishes and a description of modern protective finishes are included.

Finishes selected for the stairs were one spirit shellac, one short oil mop-on varnish, three short oil varnishes, and two penetrating seals. Observations for cleanliness, scratches, and chipping were made at stated intervals during a period of 2 yr. of constant use and regular care, including refinishing of the varnished and shellacked stairs at the end of 6 mo. and 1 yr. and recoating of the liquid seal finishes with liquid wax after each cleaning and a second application of the seal, followed by two coats of wax at the end of 1 yr. For the oak flooring the penetrating seal finishes proved to be by far the most satisfactory in all respects, followed by shellac, the short oil mop-on varnish, and last by the regular short oil varnishes, all of which were in very poor condition at the end of the period. For the pine flooring the penetrating seal finish proved satisfactory with respect to scratches and chipping, but gave no better results for cleanliness than the short oil varnishes. In this respect the shellac ranked first, followed by the short oil mop-on varnish.

Four penetrating seal finishes and one water emulsion wax were used in restoring sections of the old pine floor after cleaning and sanding. All of the penetrating seals proved much more satisfactory than the water emulsion waxes, although one did not clean as well as the others. It is thought that the penetrating seal finishes, if of good quality and well protected with a thin even layer of wax film, are satisfactory even for pine floors. This has been borne out by 18 months' experience in the use of such a finish, with frequent cleaning and rewaxing in a community hall subjected to very hard usage.

Although too few tests have been made with the accelerated wear machine to report definite results, the work to date has shown the desirability in finishing floors of preparing a very smooth surface and applying the finish as evenly as possible. "The additional expense involved may very likely be offset by the increased length of the satisfactory wear period."

Ten wood finishes, including four varnishes, one mop-on varnish, four mop-on seals, and one spirit varnish were tested for resistance to water by applying

each of the finishes evenly to all sides of small wooden blocks and recording the changes in weight under differing conditions of atmospheric humidity. In comparison with four unfinished blocks, all of the finished blocks showed marked decreases in change in weight over the unfinished, with some having better water-repellent qualities than others. One of the penetrating mop-on seal finishes showed the greatest water-repellent properties.

"The results of this study indicate that satisfactory standard laboratory equipment and test methods may be developed for measuring the essential qualities in floor or wood finishes. The use of such standard measurements would afford a means for maintaining reliable label information for consumer guidance in buying these products."

Sanitary and physiological aspects of flooring materials, J. M. DALLA VALLE (*Pub. Health Rpts. [U. S.]*, 55 (1940), No. 42, pp. 1884-1892).—Certain physical measurements of flooring materials, such as wear, resiliency, heat transmission, and acoustical transmission are discussed in relation to certain sanitary and physical aspects, namely, dustiness, fatigue, coldness, and noise. The studies serving as a basis for this discussion are cited. It is concluded that "floors constructed in accordance with the best accepted technics possess only slight differences in physical properties. Complaints often made in regard to certain kinds of floors, with a few exceptions, can be attributed to poor design, materials, workmanship, or construction."

MISCELLANEOUS

History of the Kansas State College of Agriculture and Applied Science, J. T. WILLARD (*Manhattan: Kans. State Col. Press*, 1940, pp. VIII+568, [pl. 1, figs. 128]).—This is mainly a chronological history.

The American agricultural press, 1819-1860, A. L. DEMAREE (*New York: Columbia Univ. Press*, 1941, pp. [XXI]+430, [pls. 12]).—Following a brief discussion of early American agricultural literature, part 1 of this book deals with the American agricultural press, 1819-60, as a collective entity. Part 2 presents "28 selected articles which furnish the real flavor of these periodicals." Part 3 gives a more detailed study of 16 periodicals "chosen for special study."

Statistical procedures and their mathematical bases, C. C. PETERS and W. R. VAN VOORHIS (*New York and London: McGraw-Hill Book Co.*, 1940, pp. XIII+516, figs. 42).—This book presents and explains the origin and uses of the more general statistical formulas pertaining to variability, probability, correlation, and variance.

Statistical methods, G. W. SNEDECOR (*Ames: Iowa State Col. Press*, 1940, 3. ed., [rev.], pp. XIII+422, figs. [22]).—A revision of the book previously noted (*E. S. R.*, 80, p. 324) with the addition of a chapter on design and analysis of samplings.

Statistical methods for medical and biological students, G. DAHLBERG (*London: George Allen & Unwin; New York: Interscience Pubs., Inc.*, [1940], pp. 232, figs. 13).—The essentials of statistical analysis of medical and biological data are presented.

Practical difficulties met in the use of experimental designs, A. E. BRANDT. (U. S. D. A.). (*Jour. Amer. Statist. Assoc.*, 35 (1940), No. 209, pt. 1, pp. 101-106).—These difficulties are divided into the following classes: (1) Those met with in securing the adoption of modern designs, (2) those involving proper selection and execution of modern designs, and (3) those connected with the analysis of the results. The author's experiences with difficulties in each of these classes in agricultural field trials are discussed.

A solution of normal equations giving the standard errors of the constants, W. D. BATTEN. (Mich. Expt. Sta.). (*Jour. Agr. Res. [U. S.]*, 61 (1940), No. 3, pp. 237-240).—A method suitable for machine calculation for finding the c values of Fisher (E. S. R., 80, p. 604) and regression constants.

Report of the Secretary of Agriculture, 1940, H. A. WALLACE (*U. S. Dept. Agr., Sec. Agr. Rpt., 1940, pp. IV+184*).—The principal findings in this report are noted elsewhere in this issue.

Science and the land: Sixty-first Annual Report of the New Jersey State Agricultural Experiment Station and Fifty-third Annual Report of the New Jersey Agricultural College Experiment Station for the year ending June 30, 1940, W. H. MARTIN (*New Jersey Stat. Rpt. 1940, pp. [I]+151, figs. 16*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-third Annual Report [of Cornell Station], 1940, C. E. LADD ET AL. (*[New York] Cornell Sta. Rpt. 1940, pp. 79-195*).—The experimental work reported is for the most part noted elsewhere in this issue.

Science serving agriculture: Biennial Report [of Oklahoma Station, 1939-40], W. L. BLIZZARD ET AL. (*Oklahoma Sta. Bien. Rpt. 1939-40, pp. XV+190, figs. 61*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Farm research in South Dakota: Fifty-third Annual Report [of South Dakota Station, 1940], I. B. JOHNSON ET AL. (*South Dakota Sta. Rpt. 1940, pp. [2]+95, figs. 13*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

Fifty-second Annual Report [of Texas Station], 1939, A. B. CONNER ET AL. (*Texas Sta. Rpt. 1939, pp. 304*).—The experimental work not previously reported is for the most part noted elsewhere in this issue.

Research aids Utah agriculture: Biennial Report, Utah Agricultural Experiment Station, 1938-1940, R. H. WALKER (*Utah Sta. Bul. 294 (1940), pp. 119, figs. 58*).—The experimental work reported is for the most part noted elsewhere in this issue.

Epistle to the farm: [Biennial Report of West Virginia Station, 1939-40], C. R. ORTON (*West Virginia Sta. Bul. 298 (1940), pp. 40, figs. 21*).—The experimental work not previously referred to is for the most part noted elsewhere in this issue.

NOTES

Colorado College and Station.—Homer J. Henney, chief of the program planning division of the U. S. D. A. Federal Crop Insurance Corporation, has been appointed dean of agriculture and director of the station beginning July 1.

Purdue University and Indiana Station.—Swine breeding projects in cooperation with the U. S. D. A. Regional Swine Breeding Laboratory have been initiated on the Pinney-Purdue Farm at Wanatah and the Herbert Davis Forestry Farm at Farmland. At the latter location an inbred strain of Chester White is being established and at the former an inbred strain from a foundation of Duroc-Landrace.

Gordon Fredine, biologist in charge of wildlife management and conservation in the Minnesota Department of Conservation, has been appointed associate in the department of forestry and conservation beginning April 1. Charles M. Kirkpatrick has been appointed instructor in wildlife management and conservation and assistant in the station vice J. C. Kase, who has accepted a position with the Indiana State Department of Conservation.

Kansas College and Station.—On March 15 a fire of unknown origin destroyed two frame buildings originally constructed by the Federal Government in 1918 to house enlisted men who were stationed at the college for training in vocational lines. One building was being used for teaching and investigational work in agricultural engineering, and the other had been converted into a small-animal laboratory building which provided space for the departments of animal husbandry, zoology, and bacteriology of the station. All records of the experimental work were stored in fireproof safes and were saved, and the greatest loss consisted of strains of guinea pigs developed through more than 20 years and used in animal genetics studies. Aside from the buildings the financial loss has been placed at \$16,840.

Dr. A. E. Schumacher has been appointed associate professor of poultry husbandry and associate poultry husbandman effective June 1.

Louisiana University and Station.—Dr. T. J. Arceneaux, assistant professor of agronomy, has resigned to become dean of agriculture in the Southern Louisiana Institute. Dr. Clara Tucker, professor and director of student teaching in home economics at the Texas State College for Women, has been appointed professor and head of the department of home economics.

Thomas H. Jones, station entomologist from 1920 to 1923, died at Morristown, N. J., on February 22 at the age of 55 years. A native of Rhode Island, he was graduated from the Massachusetts College in 1908. Aside from his work in Louisiana and 3 years as entomologist of the Puerto Rico Sugar Producers' Station from 1911 to 1914, he was associated with the entomological work of the U. S. Department of Agriculture, notably that with gypsy moth parasites. At the time of his death he was a senior entomologist in the Division of Forest Insect Investigations of the Bureau of Entomology and Plant Quarantine engaged in research on the Dutch elm disease.

Massachusetts College.—At the instance of the Associate Alumni, a bill has been introduced into the legislature to change the name of the institution to the University of Massachusetts. This bill has received a favorable report from the House Committee on Agriculture.

Following a clarification by the courts of the provisions of the Lotta Crabtree fund (M. S. R., 58, p. 601), increased aid to undergraduates expecting to engage in agriculture has been made available, 16 scholarships recently being awarded to members of the freshman class.

Michigan College and Station.—President R. S. Shaw is to retire on July 1 after 39 years' service and will be succeeded by John A. Hannah, secretary of the State Board of Agriculture.

Levi R. Taft, in charge of the horticultural work of the college and station from 1888 to 1909 and subsequently president of a commercial orcharding company, died in Petoskey, Mich., on February 12. Prof. Taft was born in Massachusetts on August 22, 1859, graduated from the Massachusetts College in 1882, and served as assistant professor of horticulture there for the following 3 years. In 1885 he accepted a similar position in the University of Missouri and received the M. S. degree there on leaving in 1888. In Michigan he was also appointed superintendent of farmers' institutes and State inspector of nurseries and orchards in 1902, continuing in the former capacity until 1917 and in the latter work until 1921, when he became chief horticulturist of the State Board of Agriculture for 5 years. As one of the pioneer station horticulturists he initiated much testing of varieties and similar work. Among his many writings may be mentioned Greenhouse Construction, 1891, and Greenhouse Management, 1895, both of which were standard college texts for many years.

Missouri University and Station.—W. S. Arbuckle, instructor in dairy husbandry and assistant dairy husbandman, has resigned to become assistant professor of dairy manufactures in the Texas College and Station.

New Hampshire University and Station.—Director John C. Kendall, prominently associated with the work of the institution since 1910, died March 16 at the age of 64 years. A native of New Hampshire, he was graduated from the college in 1902 and returned to it after 5 years as instructor and assistant professor of dairying and assistant in dairying in the North Carolina College and Station and 3 years as professor of dairy husbandry and dairy husbandman in the Kansas College and Station. His original appointment in 1910 was as director of the station, a position which he filled for nearly 30 years. In 1912 he also became director of extension. Much development of the agricultural work of the institution took place under his leadership. He was especially successful in bringing the institution in close touch with the people of the State, and this led logically in 1938 to his designation as director of the general extension service of the university.

Cornell University and Stations.—A luncheon illustrating the role of agricultural research in developing New York State food products was given at the university in honor of Governor Herbert H. Lehman during his visit to the Thirty-fourth Farm and Home Week. All foods served at this luncheon were associated with research conducted at the Cornell and New York State Stations. The occasion received much publicity from the newspapers of the State.

Utah College and Station.—D. W. Pittman, professor of soils and associate agronomist, has been granted leave of absence to become specialist in soils for the Department of Agriculture of Iran (Persia). His work will be taken over by Dr. H. B. Peterson.

George A. Carpenter, research associate professor of agricultural economics, has been appointed extension agricultural economist vice Dr. O. J. Wheatley, who has accepted a position with the U. S. D. A. Farm Security Administration.

Virginia College and Station.—Dr. Paul B. Barringer, president from 1907 to 1918, died at Charlottesville on January 9, aged 84 years. A native of North Carolina, he was educated largely at the University of Virginia and from 1896

to 1903 was a member of its medical faculty. He was the author of *The American Negro, His Past and Future*, and other articles on the race problem.

Recent appointments include A. M. Baisden as superintendent of the new sub-station in Orange County and Dr. Allen D. Edwards as associate rural sociologist.

Washington Station.—Floyd B. Wolberg has been appointed assistant dairy husbandman with headquarters at the Western Washington Station vice Ralph E. Hodgson, resigned.

Wisconsin University and Station.—Professor Emeritus Ransom A. Moore, from 1895 until his retirement in 1936 associated with the agronomic and extension work of the institution, died February 26, age 80 years. Prof. Moore was a native of Wisconsin, grew up under frontier conditions, and was largely self-educated. Coming to the university as an assistant to Dean W. A. Henry, he developed the short courses and boys' and girls' clubs, established the first grain-breeding nursery in the State, and in 1901 brought together the short-course students whom he had trained in the technics of producing superior grains and forages into an organization of purebred seed growers known as the Wisconsin Agricultural Experiment Association, a medium which has functioned successfully for 40 years, for the dissemination of foundation seed stocks of pedigreed grains and improved forages produced by the station. When the agronomy department of the College of Agriculture was organized in 1903 he was made its chairman. In the words of a recent memorial by his colleagues, "under his leadership for 32 years agronomic research, teaching, and extension were motivated by an idealism that was imbued with practicality and an understanding of the realities of the urgent needs of Wisconsin farmers and Wisconsin agriculture."

Cold Spring Harbor Symposium on Genes and Chromosomes.—The 1941 symposium of the Biological Laboratory at Cold Spring Harbor, Long Island, N. Y., is to be held from June 18 to July 2. The general subject will be genes and chromosomes, including the structure of chromosomes as revealed by optical methods, salivary gland chromosomes, spontaneous and induced changes in chromosome structure, mutations, physical aspects and tools, and properties of giant molecules as related to chromosome problems.

New Journals.—The establishment of *American Journal of Veterinary Research*, published quarterly by the American Veterinary Medical Association at 600 South Michigan Avenue, Chicago, has been noted editorially (*E. S. R.*, 83, p. 434). The initial number contains 18 articles.

Quarterly Journal of Studies on Alcohol is being published by the Journal of Studies on Alcohol, Inc., 4 Hillhouse Avenue, New Haven, Conn. The initial number contains several articles reporting the results of research, among them *The Influence of Alcohol on the Adequacy of the B Vitamins in the American Diet*, by N. Joliffe.

The Indian Journal of Entomology is being published semi-annually at New Delhi by the Entomological Society of India. It will be devoted to all branches of entomology. The initial number contains several articles of economic interest, among them *Entomology in India—A Retrospect*, by T. V. R. Ayyar.

Agronomia, a monthly journal of scientific agriculture, is being published at Habana, Cuba, as the official organ of the Society of Agriculture and Chemistry. The initial number contains among other material several original articles and the text of the fertilizer law of 1936.

The Conservation Volunteer is being published monthly at St. Paul, Minn., as the official bulletin of the Minnesota Department of Conservation.

INDEX OF NAMES

- Aamodt, O. S., 467, 627.
 Abbe, E. C., 18.
 Abbott, E. V., 207.
 Abbott, J. S., 324.
 Abbott, O. D., 564.
 Abell, M. F., 322.
 Abercrombie, W. F., 503.
 Abrahamsen, M. A. 683
 Abrams, L., 594.
 Abt, A. F., 566.
 Acevedo, R. A., 525, 676.
 Ackerman, J., 111.
 Ackerman, R. A., 806.
 Ackerson, C. W., 94.
 Ackett, J. E., 252.
 Acosta y Calbo, J. J., 206.
 Acree, R. J., 627.
 Adair, C. R., 40, 614.
 Adams, G., 846.
 Adams, G. E., 401.
 Adams, J. E., 347, 348, 611.
 Adams, M., 628.
 Adams, W. L., 373.
 Addinall, C. R., 849.
 Adler, J., 750.
 Afanasiev, M., 329, 757.
 Afanasiev, M. M., 58, 627.
 Agati, J. A., 60, 448.
 Aggeler, P. M., 852.
 Agnew, E. L., 210.
 Agustina Bataña, M., 601.
 Ahmad, B., 131.
 Ahmad, T., 225, 788.
 Aikman, J. M., 762.
 Ainsworth, G. C., 631.
 Akamine, E., 303.
 Åkerberg, E., 321.
 Akin, E. P., 758.
 Albaum, H. G., 18, 596.
 Albeiter, J. K., 828.
 Albert, A. R., 755.
 Albertson, F. W., 180.
 Albrecht, H. R., 33, 78, 646.
 Albrecht, W. A., 168, 179, 301, 829.
 Alden, P. E., 11.
 Alderman, W. H., 760.
 Aldous, S. E., 356, 782.
 Alex, A. H., 757, 787.
 Alexander, L., 850.
 Alexander, L. T., 293.
 Alexander, R. A., 523.
 Alexander, W. W., 687.
 Alfend, S., 729.
 Allicata, J. E., 388.
 Alimnosa, L. M., 161.
 Allard, H. A., 28, 309.
 Allard, H. F., 28.
 Allie, W. C., 178, 461.
 Allen, A. A., 781.
 Allen, C. E., 658.
 Allen, E., 314.
 Allen, E. A., 535.
 Allen, E. K., 447.
 Allen, F. W., 191.
 Allen, H. R., 15.
 Allen, H. W., 73, 88.
 Allen, L. N., 460, 470.
 Allen, N., 493, 494, 652.
 Allen O. N., 447.
 Allen, P. W., 381.
 Allen, R. C., 338, 765.
 Allen, R. H., 255.
 Allen, T. C., 76, 77, 500.
 Allin, B. W., 657.
 Allison, F. E., 21, 168.
 Allorge, P., 160.
 Allred, C. E., 38, 260, 261, 264, 266, 268, 406, 408.
 Allyn, R. B., 155.
 Almquist, H. J., 94, 294, 506.
 Alphin, T. H., 159.
 Alsberg, C. L., 288.
 Altman, I. E., 677.
 Altmann, M., 316.
 Altschaffer, J. H. R., 681.
 Altstatt, G. E., 342, 770, 823.
 Alvarez, García, L. A., 638.
 Amerine, M. A., 295.
 Amstein, W. G., 620.
 Andersen, A. M., 18, 469.
 Anderson, E. G., 456.
 Anderson, E. M., 759.
 Anderson, E. O., 295.
 Anderson, G. W., 385.
 Anderson, H. D., 664, 801.
 Anderson, H. O., 682.
 Anderson, H. W., 53, 59, 169, 205, 630.
 Anderson, J. A., 240.
 Anderson, K., 107.
 Anderson, K. L., 465.
 Anderson, L. D., 80, 781.
 Anderson, N., 692.
 Anderson, T. G., 517.
 Anderson, W. A., 690, 834.
 Anderson, W. S., 177, 319, 756.
 Andison, H., 642.
 Andrews, E. D., 151.
 Andrews, F. N., 610.
 Andrews, F. S., 185.
 Andrews, H. J., 767.
 Andrews, W. B., 34, 177, 308, 325.
 Andrus, C. F., 630.
 Andrus, W. D., 715.
 Angelini, F., 110.
 Angove, P. C., 231.
 Anker, D. L. W., 681.
 Anthony, E. L., 144.
 Anthony, J. L., 15, 319, 755.
 Anthony, R. D., 471.
 Antopol, W., 563.
 Appleman, C. O., 399.
 Aquino, D. I., 17.
 Arant, F. S., 73, 494, 648.
 Ararbanel, A. R., 608.
 Arbuckle, W. S., 240, 387, 812, 861.
 Arceneaux, T. J., 860.
 Archer, C. J., 622.
 Archer, J. C., 323.
 Archer, W., 510.
 Arctowski, H., 153.
 Aik, P. A., 628.
 Armstrong, G. M., 627.
 Armstrong, T., 218.
 Armstrong, T. V., 523.
 Arnold, A., 132, 664.
 Arnold, J. J., 395.
 Arnold, P. T. D., 226.
 Airon, D. I., 22, 291.
 Arrillaga, J. G., 764.
 Arruda, S. C., 211, 637.
 Arthur, G. B., 24.
 Arthur, J. M., 16, 337.
 Asai, G. N., 16.
 A-bury, S. E., 445.
 Asdall, S. A., 31, 619, 747, 795.
 Asenjo, C. F., 102, 103.
 Ashley, T. E., 48, 760, 762.
 Askew, H. O., 777.
 Aslett, M., 293.
 Asmundson, V. S., 96.
 Asplin, F. D., 821.
 Atchley, F. M., 679.
 Atkin, L., 171.
 Atkins, I. M., 752.
 Atkinson, C. H., 738.
 Atkinson, N., 674.

- Atwater, B. R., 470.
 Auchter, E. C., 4.
 Audus, L. J., 450.
 Aughey, E., 703.
 Aull, G. H., 537.
 Avens, A. W., 643.
 Avery, A. G., 747.
 Avery, G. S., Jr., 17, 453.
 Avery, T. B., 233, 513.
 Axelrod, A. E., 707.
 Axelsson, J., 796.
 Aykroyd, W. R., 708.
 Ayyar, T. V. R., 215, 504, 862.
 Azara, A., 256.
 Babcock, M. C., 795.
 Babcock, M. J., 31, 805.
 Babcock, O. G., 787.
 Bacharach, A. L., 694.
 Back, E. A., 372.
 Baeyerztz, F. P., 332.
 Bailey, B. E., 730.
 Bailey, C. H., 42, 438, 546, 560, 744.
 Bailey, D. M., 472.
 Bailey, E. M., 228, 271, 592.
 Bailey, G. W., 143.
 Bailey, L. F., 16.
 Bailey, L. H., 414, 729.
 Bailey, R. Y., 177.
 Bailey, S. F., 75, 499, 790.
 Bailey, W. K., 74.
 Bain, H. F., 19.
 Baines, B. C., 199.
 Bair, H. L., 130.
 Baisden, A. M., 862.
 Baitsell, G. A., 741.
 Baker, C. E., 185.
 Baker, D. W., 247, 396, 397, 668, 813, 817, 818.
 Baker, G. A., 96.
 Baker, G. O., 298, 319, 825.
 Baker, H., 75.
 Baker, J. A., 407.
 Baker, K. F., 342.
 Baker, O. E., 4, 687.
 Baker, R. E. D., 481.
 Baker, W. A., 785.
 Bakhsh, I., 710.
 Bakken, H. H., 682.
 Balch, R. E., 651.
 Balch, R. T., 437, 468.
 Bald, J. G., 775.
 Baldwin, W. V., 789.
 Baldwin, C. B., 689.
 Baldwin, F. M., 318.
 Baldwin, I. L., 582, 603.
 Ballard, S. S., 293.
 Ballinger, R. A., 402.
 Ballou, C. H., 785.
 Balls, A. K., 43, 291, 728.
 Bandean, D. A., 324.
 Bandemer, S. L., 511.
 Bandier, E., 9.
 Bana, L., 5, 145.
 Banerjee, H. N., 446.
 Banfield, L. F., 816.
 Banfield, W. M., 627.
 Bankowski, R. A., 398.
 Barber, G. W., 493, 649.
 Barber, T. C., 493.
 Barbour, W. J., 638.
 Bare, C. O., 494.
 Barkan, G., 275.
 Barker, D., 510.
 Barker, H. D., 489, 630.
 Barker, R. G., 173.
 Barker, S. B., 124.
 Barnes, C. P., 829.
 Barnes, E. O., 487.
 Barnes, G. W., 226.
 Barnes, H. F., 215, 221.
 Barnes, L. L., 31, 795.
 Barnett, C. R., 143.
 Barnett, R. J., 620, 763.
 Barnette, W. A., 383.
 Barr, W. L., 517, 685.
 Barrett, F. N., 661.
 Barrett, F. W., 826.
 Barrett, J. T., 627.
 Barringer, P. B., 861.
 Barrons, K. C., 44, 489.
 Barsa, H. P., 67, 489.
 Barthel, C., 590.
 Bartholomew, W. V., 455.
 Bartlett, R. W., 262.
 Bartlett, S., 517, 518.
 Barton, G. T., 113.
 Bartram, M. T., 414.
 Basak, N. M., 416.
 Basinger, A. J., 493.
 Basore, C. A., 324.
 Bass, L. W., 325.
 Basu, K. P., 416.
 Batalla, M. A., 601.
 Batchelder, E. L., 144.
 Baten, W. D., 194.
 Bates, M., 220.
 Bates, R. W., 319.
 Bathurst, E. G., 268.
 Batjer, L. P., 50, 473, 474, 619, 761.
 Batten, E. T., 39.
 Batten, W. D., 859.
 Battle, J., 249.
 Bauer, J. H., 524.
 Bauer, K., 58.
 Bauernfeind, J. C., 514.
 Baum, R. O., 442.
 Baum, W. S., 559, 702.
 Baumann, C. A., 131.
 Baumberger, J. P., 17.
 Baur, K. H., 642.
 Bausman, R. O., 114, 256, 690.
 Bawden, F. C., 202.
 Baxter, J. G., 438.
 Bayer, L. M., 555.
 Bayles, J. J., 757, 795.
 Baylis, G. T. S., 205.
 Baynes, W. C., 473.
 Bazeley, P. L., 249, 675.
 Beach, B. A., 527, 669.
 Beach, G. A., 334, 764.
 Beach, J. R., 398, 532, 821.
 Beach, W. S., 480, 627.
 Beachell, H. M., 752.
 Beadenkopf, W. G., 609.
 Beadle, B. W., 729.
 Beadle, N. C. W., 626.
 Beadles, J. R., 507.
 Beal, M., 682.
 Beal, W. J., 721.
 Beale, H. P., 627.
 Beall, D., 29.
 Beall, J. A., 795.
 Beall, B. T., 687.
 Beam, A. L., 464.
 Bean, C. W., 251.
 Bean, L. H., 686, 832.
 Beard, D., 531, 675.
 Beard, D. B., 70.
 Beard, J. W., 338, 531, 602, 675.
 Beard, R. L., 646.
 Beard, R. M., 540.
 Beasley, J. O., 752.
 Beath, O. A., 101, 307.
 Beattie, J. H., 39.
 Beattie, R. K., 68.
 Beattie, W. R., 331.
 Beauchamp, C. E., 806.
 Beaudette, F. R., 532, 822.
 Beaulieu, A. A., 502.
 Beaumont, A., 585.
 Bechdel, S. I., 464, 507, 517.
 Beck, F. V., 682.
 Beck, H. H., 663.
 Becker, E. R., 103, 524.
 Becker, J. E., 841.
 Becker, R. B., 226.
 Beckwith, C. S., 495, 621.
 Becnel, I. J., 357.
 Bedenbaugh, F. G., 381.
 Bee, L. S., 834.
 Beebe, J. M., 455.
 Beeman, E., 461.
 Beeson, W. M., 372, 389.
 Beetle, A. A., 593.
 Beharrell, J., 798.
 Behre, C. E., 56.
 Bellmann, A. P., 25.
 Beinzger, W., 110.
 Bell, H. P., 761.
 Bell, R. S., 164.
 Bell, W. B., 526.
 Bellue, M. K., 638.
 Bender, C. B., 807.
 Bender, T. R., 342.
 Benedek, T., 744.
 Benedict, M. R., 681.
 Bengtsson, N., 590.
 Benne, E. J., 330, 583.
 Bennett, C. C., 627.
 Bennett, C. W., 202.
 Bennett, H. H., 687, 736.
 Bennett, H. O., 190.
 Bennett, H. W., 177, 319, 372.
 Bennett, J. B., 829.
 Bennett, L. J., 491, 495.

- Bennetts, H. W., 91.
 Bennholdt-Thomsen, C., 713.
 Bensley, R. R., 100.
 Bensley, S. H., 100.
 Benson, A. O., 56.
 Bent, A. C., 73.
 Bentancur, M. O., 203.
 Bentley, F. L., 506, 536.
 Bentley, R. C., 408.
 Bento Pickel, D., 437.
 Benton, C., 212.
 Benton, M., 268.
 Benton, T. H., 156.
 Bequaert, J., 221.
 Bercaw, I. O., 119, 154, 257.
 Berch, H., 629.
 Beresford, H., 293, 399, 826.
 Berg, A., 771.
 Berg, H. A., 682.
 Berge, S., 800.
 Berger, J., 102, 103.
 Bergman, A. J., 611.
 Bergner, A. D., 747.
 Berlin, V. R., 463.
 Bernard, R., 781.
 Bernids, M., 845.
 Bero, D., 523.
 Berridge, A., 234, 661.
 Berry, G. P., 249.
 Berry, R. O., 813.
 Bertelli, J. C., 778.
 Bertram, D. S., 534.
 Besley, L., 768.
 Bessey, E. A., 616.
 Best, R. J., 486.
 Bethel, J. S., 767.
 Bethke, B. M., 143, 227, 510, 799.
 Bever, W. M., 69, 342.
 Bevis, H. L., 144.
 Bhaduri, P. N., 310.
 Bhatia, D., 738.
 Bhattacharjee, J., 245.
 Biale, J. B., 23, 193.
 Bicknell, F., 714.
 Bidwell, D. L., 154.
 Bieberdorf, G. A., 786.
 Bier, J. E., 354, 780.
 Bierer, B. W., 100, 524.
 Blester, H. E., 319.
 Blasing, S. W., 737.
 Binkley, A. M., 64.
 Birch, T. W., 238.
 Bird, E. W., 310.
 Bird, H. R., 506, 510, 514, 532.
 Bisbey, B., 510.
 Bisby, G. R., 593.
 Bischoff, D. L., 787.
 Bischoff, F., 459.
 Bishop, E. L., 368.
 Bishop, R. K., 654.
 Bishopp, F. C., 74.
 Biskind, G. R., 461.
 Bisschop, J. H. R., 229, 799.
 Bissell, T. L., 494, 643, 765.
 Bitancourt, A. A., 201, 635, 636.
 Bizzell, J. A., 751.
 Black, J. D., 255.
 Black, L. M., 349, 627, 778.
 Black, S., 421, 507.
 Black, W. H., 795, 796, 798.
 Blackman, M. W., 652.
 Blair, C. R., 359.
 Blair, D. S., 333.
 Blair, G. W. S., 517, 522.
 Blair, G. Y., 449.
 Blaisdell, D. J., 777.
 Blake, M. A., 52.
 Blake, S. F., 447.
 Blakeslee, A. F., 747.
 Blakeslee, L. H., 92, 659.
 Blanchard, K. L., 161.
 Blanchard, R. A., 358.
 Blanford, C. J., 263.
 Blank, L. M., 484, 770.
 Blanton, F. S., 642.
 Blaser, R. E., 178, 613.
 Blatchley, W. S., 357.
 Blauvelt, W. E., 503.
 Bledsoe, R. F., 321, 326, 347, 614.
 Blickle, R. L., 360.
 Bliss, D. E., 627.
 Blitz, R. O., 388.
 Blizzard, W. L., 579, 795, 859.
 Blodgett, E. C., 58, 342, 768.
 Blodgett, F. M., 627, 769.
 Blood, P. T., 326, 614.
 Bloomfield, A. L., 842.
 Bloxham, H. P., 650.
 Blume, J. M., 591.
 Board, S. S., 4.
 Bobb, M. L., 217.
 Bodenheimer, F. S., 217.
 Bodian, D., 317.
 Bodine, E. W., 206, 210, 343, 347, 627, 774.
 Bodine, J. H., 790.
 Bogart, R., 31.
 Bøgh, H., 321.
 Bohart, R. M., 647.
 Bohstedt, G., 662, 663, 669, 755.
 Bojar, S., 609.
 Boka, N., 592.
 Boley, L. E., 230, 394, 822.
 Bollin, D. W., 372.
 Bollen, W. B., 67.
 Bolong, D. S., 509.
 Bonde, R., 64.
 Bondurant, J. H., 117.
 Bondy, F. F., 494.
 Bonham, K., 782.
 Bonisteel, W. J., 171.
 Bonnemaision, L., 645, 776.
 Bonnen, C. A., 325, 401, 828.
 Bonner, J., 305, 597.
 Bonner, J. P., 399.
 Bonnet, F., 571, 572.
 Bonnier, G., 605.
 Bonser, H. J., 261.
 Bonsma, F. N., 375.
 Bongsma, J. C., 658.
 Booher, L. E., 695.
 Booth, A. N., 662, 663, 807.
 Booth, V. H., 10.
 Bopst, L. E., 143.
 Borden, R. J., 299, 615.
 Borel, A., 110.
 Borland, A. A., 517.
 Borlaug, N. E., 627.
 Borst, H. L., 442.
 Boruff, C. S., 507.
 Bose, S. B., 200.
 Bosman, V., 800, 855.
 Boswell, J. G., 453.
 Boswell, V. R., 472, 759.
 Botley, C. M., 153.
 Botsford, H. E., 231.
 Bottomley, A. C., 238.
 Bottum, J. C., 256.
 Boucher, C. S., 144.
 Boucher, R. V., 507, 676.
 Boughton, D. C., 505.
 Boughton, I. B., 787, 795, 814.
 Bourne, A. I., 78.
 Bourne, B. A., 775.
 Boutwell, R. R., 664.
 Bowden, R. A., 779.
 Bowden, W. M., 171, 604.
 Bowen, A. B., 177, 590.
 Bowen, J. T., 826.
 Bowers, R. E., 493.
 Bowld, W. F., 325.
 Bowling, G. A., 807, 808.
 Bowman, A. B., 196.
 Bowman, A. E., 3.
 Bowman, J. J., 66, 352.
 Bowman, K. M., 708.
 Boxell, K. C., 235.
 Boyce, A. M., 218, 362.
 Boyce, E. F., 153, 798.
 Boyce, J. S., 637.
 Boyd, F. T., 613.
 Boyd, H. B., 687.
 Boyd, J. D., 853.
 Boyd, K., 137.
 Boyd, O. C., 199, 768.
 Boyd, W. L., 249, 674.
 Boyer, F. B., 690.
 Boynton, D., 48, 50, 51, 209, 761.
 Boynton, W. H., 388, 530.
 Bracken, A. F., 183, 616.
 Bradfield, R., 291, 735, 751.
 Bradford Hill, A., 456.
 Bradley, H. C., 730.
 Bradley, W. B., 101.
 Bradley, W. G., 735.
 Bradshaw, H. C., 828.
 Brady, D., 429.
 Brady, D. E., 316, 872.
 Brady, D. S., 717, 856.
 Bramble, W. C., 364.
 Brannan, G. A., 659.
 Brandly, C. A., 107, 389, 534.
 Brandon, J. F., 466, 613.

- Brandow, G. E., 432.
 Brandt, A. E., 358.
 Brannen, C. O., 401.
 Brannon, J. M., 238, 357.
 Branton, I., 109.
 Brase, K. D., 48, 189, 195.
 Brasher, E. P., 754, 758.
 Bratley, C. O., 199, 768.
 Bratley, H. E., 217, 650.
 Bratton, R. W., 234.
 Bratzler, J. W., 507.
 Braun, A. C., 483, 484, 775.
 Braun, A. J., 59.
 Bray, C. I., 226.
 Bray, M. M., 271.
 Brazer, J. G., 854.
 Breaker, E. P., 642.
 Breese, B. B., 702.
 Brehm, C. E., 144.
 Breiter, H., 845.
 Breland, O. P., 506.
 Brenckle, J. F., 447.
 Brennen, C. A., 464.
 Bressler, R. G., 144.
 Breton, M. R., 617.
 Brewer, C. A., Jr., 35, 178, 320.
 Brewer, C. M., 729.
 Brewer, H. E., 762.
 Brewer, W., 711.
 Bricker, J. W., 183.
 Brien, R. M., 211.
 Brier, G. W., 881.
 Brierley, F., 211, 487.
 Brierley, W. G., 53.
 Briggs, F. N., 773.
 Briggs, G. M., 755.
 Briggs, H. M., 230, 747, 795.
 Brigham, G. D., 525.
 Brindley, T. A., 357, 653.
 Brink, R. A., 324, 456, 601.
 Brinkerhoff, L. A., 58, 769.
 Britton, J. E., 333, 334.
 Britton, J. W., 397, 531, 813, 817.
 Britton, W. E., 575.
 Broadbent, D. A., 115.
 Broadfoot, W. M., 736, 754.
 Broch, O. J., 283.
 Brody, A. L., 83, 494, 650.
 Brody, H. W., 164.
 Brody, S., 227.
 Brogdon, E., 843.
 Bromley, S. W., 216.
 Bronson, T. E., 364.
 Brookhart, J. M., 173.
 Brooks, C. M., 609.
 Brooks, J., 93.
 Brooks, J. W., 77.
 Brooks, L. E., 752, 770, 796.
 Brooks, R. M., 454.
 Broughton, L. B., 143.
 Brown, A. J., 117, 592.
 Brown, A. M., 348, 627.
 Brown, A. P., 711.
 Brown, W. A., 495.
 Brown, B. A., 180.
 Brown, B. E., 592.
 Brown, C. V., 586.
 Brown, D. S., 758.
 Brown, E. F., 701.
 Brown, G. A., 92, 659.
 Brown, G. D., 854.
 Brown, H. B., 178, 775.
 Brown, H. D., 422.
 Brown, H. E., 224, 359.
 Brown, I. C., 738.
 Brown, J. G., 475, 627, 628.
 Brown, J. W., 602.
 Brown, L. M., 720.
 Brown, L. T., 678.
 Brown, O. A., 726.
 Brown, P. E., 591.
 Brown, R. A., 714.
 Brown, R. H., 153.
 Brown, W. C., 98, 807.
 Brown, W. H., 235.
 Brown, W. J., 223.
 Brown, W. S., 762.
 Browne, C. A., 291.
 Browne, H. C., 716.
 Browning, G. M., 13, 736.
 Brownee, O. H., 112.
 Broyer, T. C., 166, 307, 595.
 Broyles, W. A., 545.
 Bruce, W. G., 222, 493.
 Bruch, H., 272.
 Bruckner, J. H., 747.
 Bruhn, H. D., 678.
 Brumley, F. W., 115.
 Brundage, R. C., 196.
 Bruner, D. W., 103, 397, 535, 821.
 Brunner, E. DeS., 411.
 Brunner, H. S., 545.
 Brunson, A. M., 80, 178, 200, 358, 501.
 Brunstetter, B. C., 475, 763.
 Bryan, A. A., 604, 614.
 Bryan, C. S., 97, 395, 520.
 Bryant, H. W., 522.
 Bryant, J. E., 275.
 Bryant, L. E., 52, 295, 764.
 Bryant, T. E., 144.
 Bryson, V., 172.
 Buchanan, J. H., 413.
 Buchanan, R. E., 144, 455.
 Buchanan, T. S., 780.
 Buchanan, W. D., 357.
 Buchet, S., 160.
 Bucholtz, L., 602.
 Buck, J. M., 669.
 Buck, R. K., 404, 829.
 Buckardt, H. L., 268.
 Buckell, E. R., 362.
 Buckner, G. D., 510, 511.
 Buckner, R. P., 647.
 Bueding, E., 705.
 Buehle, J. D., 495.
 Buell, J. H., 193.
 Buhrer, E. M., 489.
 Bulchis, R., 340.
 Bulgaru, V., 256.
 Bull, C. P., 470.
 Bull, H. D., 548, 549.
 Bull, L. B., 222.
 Buller, A. H. R., 627.
 Bunce, A. C., 255.
 Bunker, H. J., 428.
 Bunn, R. W., 785.
 Burack, E., 606.
 Burch, J. W., 3.
 Burdick, H. O., 400.
 Burdick, R. T., 257, 405.
 Burger, J. W., 177.
 Burgess, A. F., 643.
 Burgess, E. D., 357.
 Burgess, P. S., 141.
 Burhoe, S. O., 450.
 Burk, E. F., 752.
 Burke, O. D., 627.
 Burkey, L. A., 241.
 Burkholder, C. L., 185, 359, 366.
 Burkholder, P. R., 164.
 Burkholder, W. H., 709, 779.
 Burkitt, W. H., 797.
 Burks, B. D., 654.
 Burlison, W. L., 182.
 Burnester, B. R., 510, 515, 660.
 Burnet, F. M., 669.
 Burnett, L. C., 346.
 Burns, M., 608.
 Burr, G. O., 598.
 Burrell, A. B., 66, 210, 769.
 Burrell, R. C., 422, 726, 852.
 Burri, R., 239.
 Burrill, L. M., 847.
 Burrill, M. W., 174, 460, 750.
 Burris, R. H., 17, 455.
 Burroughs, E. W., 799.
 Burrows, W. H., 510, 512.
 Burruss, J. A., 144.
 Burstein, E., 161.
 Burt, W. H., 491.
 Burtis, E. L., 687.
 Burton, W. W., 36, 178.
 Burton, J. C., 35, 178, 593.
 Bushland, R. C., 84, 650.
 Bushnell, L. D., 336.
 Bushnell, R. J., 505.
 Russell, F. P., 751.
 Butcher, F. G., 74, 499.
 Butler, E. T., 741.
 Butler, O. R., 142.
 Butlin, K. R., 428.
 Butt, H. R., 716.
 Butters, M., 144.
 Button, F. C., 809.
 Butz, E. L., 256.
 Buy, H. G. du, 16, 162, 448, 629.
 Byerly, T. C., 510.
 Byerly, T. G., 510.
 Byers, G. B., 117.
 Byers, H. G., 14.
 Byington, L. B., 392.
 Byram, G. M., 341.
 Byrd, H. C., 144.
 Byrnes, J. W., 339.

- Byrom, M. H., 823.
 Bywaters, J. H., 511.
 Cabell, C. A., 798.
 Cable, R. M., 789.
 Cabrera, D. J., 533.
 Cagle, L. R., 141.
 Cabalan, V. H., 70, 782.
 Cahill, W. M., 125.
 Cain, C. B., 389.
 Cake, E. W., 407, 832.
 Calder, R. M., 815.
 Caldwell, R. M., 200, 358.
 Calica, C. A., 60.
 Calinisan, M. R., 60.
 Call, L. E., 144, 146.
 Callaghan, A. R., 93, 375.
 Callahan, B. F., 398.
 Callan, E. M., 225.
 Callenbach, J. A., 367, 785.
 Cameron, A. E., 814.
 Cameron, H., 841, 842.
 Cameron, H. C., 138, 419, 749.
 Cameron, H. S., 388, 818.
 Cameron, H. W., 819.
 Cameron, S. H., 54, 622.
 Cameron, T. W. M., 244.
 Camp, A. F., 336.
 Camp, J. R., 829.
 Campbell, D. H., 526.
 Campbell, F. L., 77.
 Campbell, H. A., 668, 814.
 Campbell, J. A., 46, 228, 831.
 Campbell, K. H., 697.
 Campbell, L., 58.
 Campbell, W. A., 69, 627, 637.
 Campbell, W. W., 552, 554.
 Cann, F. R., 504.
 Cannon, C. Y., 662.
 Cannon, H. J., 158, 798.
 Card, C. G., 511, 661.
 Card, D. G., 117, 408.
 Card, L. E., 510, 515.
 Cardiff, I. D., 78.
 Cardinell, H. A., 189.
 Carlson, C., 271.
 Carlson, J. W., 324.
 Carlyle, E. C., 231.
 Carman, G. E., 786.
 Carnecross, J. W., 831.
 Carneiro, J. G., 487.
 Carns, W. A., 177, 590.
 Carolus, R. L., 759.
 Caroselli, N. E., 628.
 Carpenter, A. B., 585.
 Carpenter, C. D., 533.
 Carpenter, C. A., 258, 861.
 Carpenter, J. B., 564, 788.
 Carpenter, R. S., 271.
 Carpenter, S. J., 85.
 Carpenter, T. L., 76.
 Carr, A. F., Jr., 213.
 Carrera, C. J. M., 61, 481.
 Carrick, C. W., 227, 254.
 Carrigan, J. E., 144.
 Carroll, J. C., 323.
 Carsner, E., 467.
 Carson, G. B., 523.
 Carson, S. F., 603.
 Carter, C. W., 282.
 Carter, D. G., 677.
 Carter, R. H., 74.
 Carter, W. T., 325, 735.
 Cartledge, J. L., 754.
 Cartwright, K. S., 488.
 Cartwright, W. B., 212, 785.
 Carver, J. S., 381.
 Case, H. C. M., 116.
 Casey, J. E., 469, 470.
 Cash, E. K., 23, 779.
 Cash, J. G., 385.
 Casida, L. E., 458.
 Caspari, E., 457.
 Cassen, B., 438.
 Cassidy, T. P., 493.
 Castellani, A., 12.
 Castillo, B. S., 204.
 Castle, W. E., 605, 606.
 Catcheside, D. G., 456.
 Cathcart, C. S., 656.
 Cathcart, E. P., 549.
 Cathcart, W. H., 694.
 Catherwood, M. P., 827.
 Catton, D., 354.
 Caulfield, W. J., 667, 810.
 Caum, E. L., 617.
 Cauthen, G. E., 526.
 Cavin, J. P., 686.
 Celino, M. S., 60, 204, 485, 635.
 Chace, E. M., 270, 732.
 Chadderton, A. E., 379.
 Chadwick, L. C., 55.
 Chaikoff, I. L., 32, 83.
 Chalmers, J. N. M., 277, 700.
 Chamberlain, E. E., 205, 207, 209.
 Chamberlin, F. S., 493.
 Chamberlin, T. R., 785.
 Chamberlin, V. D., 94, 804.
 Chambers, E. L., 637.
 Chambers, T. B., 680.
 Chambers, W. H., 124.
 Chan, K., 78.
 Chan, S. Y., 627.
 Chance, M. B. A., 29, 30.
 Chandiramani, S. V., 748.
 Chandler, A. C., 523.
 Chandler, F. B., 633.
 Chandler, J. P., 124, 274.
 Chandler, R. F., Jr., 735.
 Chandler, S. C., 359.
 Chang, C. E., 712.
 Chapin, E. A., 228.
 Chapline, W. R., 687.
 Chapman, A. D., 490.
 Chapman, A. J., 787.
 Chapman, H. D., 54, 852.
 Chapman, H. H., 340.
 Chapman, F. J., 387, 790.
 Chapman, P. W., 144.
 Chapman, W. H., 178, 616.
 Chardon, C. E., 593.
 Charipper, H. A., 175.
 Charles, V. K., 212, 525, 627, 791.
 Charlton, J. L., 120, 681.
 Charpentier, C. A. G., 321.
 Charpentier, L. J., 358.
 Cheesman, W. H., 335.
 Cheetham, A. H., 450.
 Chen, H. K., 168.
 Ch'en, K. C., 711.
 Chenault, T. P., 492, 782.
 Cheng, L. T., 271, 282.
 Cheng, T. H., 498.
 Cheng, T. Y., 711.
 Cherrington, V. A., 389.
 Chesley, F. F., 702.
 Chester, K. S., 178, 199, 342, 433, 627, 752.
 Chew, A. P., 687.
 Cheyne, V. D., 555.
 Childester, M. S., 489.
 Childers, N. F., 164, 210.
 Childs, E. C., 737.
 Childs, W. H., 758, 761.
 Chilton, S. J. P., 627.
 Chisholm, R. D., 493.
 Chittenden, E., 777.
 Chitwood, B. G., 59, 218, 214, 639.
 Chitwood, M. B., 218, 214.
 Choussy, F., 67.
 Chow, B. F., 458.
 Christensen, C. L., 5.
 Christensen, C. M., 351, 354.
 Christensen, F. W., 508.
 Christensen, J. F., 673.
 Christensen, J. J., 28, 490, 627.
 Christensen, L. M., 293, 298.
 Christenson, R. O., 214, 496, 753, 789.
 Christiansen, W. G., 439.
 Christopher, E. P., 52.
 Chu, F. T., 700.
 Chu, H. I., 711.
 Chu, J. P., 176.
 Chumakov, M. P., 525.
 Chupp, C., 769.
 Clapp, E. H., 766.
 Clara, F. M., 60.
 Clark, B. E., 618.
 Clark, C. A., 735.
 Clark, C. F., 64, 349, 388.
 Clark, C. M., 408.
 Clark, F. H., 28.
 Clark, F. J., 312.
 Clark, J. C., 494.
 Clark, J. H., 192.
 Clark, N., 146, 669, 718.
 Clark, N. A., 742.
 Clark, R. T., 605, 655, 717.
 Clark, S. W., 737.
 Clark, T. B., 510, 511, 748, 796.
 Clark, W. C., 411.
 Clark, W. S., Jr., 481.

- Clark, W. W., 5.
 Clarke, G. L., 595.
 Clarke-Hafstad, K., 441.
 Clans, A., 788.
 Clausen, C. P., 496, 793.
 Clausen, L. B., 531.
 Clausen, S. W., 702.
 Clawson, M., 255.
 Claypool, F., 412.
 Claypool, L. L., 191.
 Clayton, C. N., 16, 628.
 Clayton, E. H., 489, 627.
 Clayton, M. M., 426, 696.
 Clayton, W. L., 325.
 Cleckley, H. M., 707.
 Clegg, R. E., 283.
 Clements, H. F., 305, 308, 741.
 Clendenin, J. C., 261.
 Cloaninger, B. D., 592.
 Cloete, J. H. L., 800, 814.
 Clyde, A. W., 536.
 Coates, W. H., 326, 614.
 Cobbett, N. G., 673.
 Cochran, H. L., 187, 760, 765.
 Cochran, L. C., 769.
 Cochran, W. G., 466.
 Cockerham, K. L., 358.
 Code, W. E., 824.
 Coe, F. M., 123, 547, 620.
 Coffey, F. A., 827.
 Coffey, W. C., 5, 577, 719.
 Coffin, H. C., 609.
 Coffman, F. A., 27, 329, 346.
 Cohen, B. B., 741.
 Cohen, J. G., 749.
 Cohen, J. I., 314.
 Cohn, W. E., 137.
 Coffle, T. S., 744.
 Colby, A. S., 53.
 Cole, C. A., 489.
 Cole, C. E., 336.
 Cole, C. L., 230.
 Cole, H. H., 459.
 Cole, J. S., 538.
 Cole, J. W., 439.
 Cole, L. J., 314, 748.
 Cole, B. K., 747, 821.
 Cole, V. V., 609.
 Cole, W. C., 523.
 Coleman, S. H., 494.
 Coleman, W. J., 406.
 Coles, J. D. W. A., 814.
 Collas, N. E., 176, 461.
 Collier, H. B., 529.
 Collins, D. L., 488, 504, 629, 786.
 Collins, E. R., 178.
 Collins, F. V., 674.
 Collins, G. P., 256.
 Collins, O. D., 269.
 Collip, J. B., 510.
 Colman, W., 357.
 Colmer, R., 143.
 Coltrane, D. S., 226.
 Colvard, D. W., 616.
 Colwell, W. E., 319.
 Comar, C. L., 150.
 Commoner, B., 16.
 Compere, H., 224, 791.
 Compton, C. C., 358.
 Compton, J., 25.
 Compton, L. E., 200.
 Comstock, J. H., 74.
 Condit, I. J., 352.
 Congdon, G. S., 551.
 Conger, T. W., 693.
 Conn, H. J., 455.
 Conn, J. E., 170, 455.
 Connell, F. H., 399.
 Connely, E. F., 2.
 Conner, A. B., 325, 578, 859.
 Conners, I. L., 771.
 Connola, D., 786.
 Conrad, C. M., 181, 451.
 Conrad, J. P., 157.
 Conrad, R. M., 233, 513, 805.
 Conrat, H. F., 458.
 Conrey, C. W., 828.
 Constance, L., 593.
 Converse, P. D., 262.
 Conway, V. M., 447.
 Conybeare, A. B., 156.
 Cook, A. H., 782.
 Cook, G. M., 417.
 Cook, H. T., 483, 630.
 Cook, J. W., 881, 513.
 Cook, R., 605.
 Cook, W. H., 379, 380, 661.
 Cooke, M. T., 213.
 Cooke, W. B., 60, 769.
 Cooley, J. S., 627.
 Cooley, B. J., 410.
 Coolidge, T. B., 212.
 Coombs, A. I., 669.
 Coons, G. H., 41, 206.
 Cooper, D. C., 601.
 Cooper, G. R., 208.
 Cooper, H. F., 615.
 Cooper, H. P., 178, 347.
 Cooper, J. B., 142.
 Cooper, J. R., 617.
 Cooper, K. W., 352.
 Cooper, S. C., 335.
 Cooper, T., 255.
 Cooper, T. P., 5.
 Cooper, W. C., 17.
 Coote, R. K., 829.
 Copeland, O. C., 806, 813.
 Coppen, F. M. V., 522.
 Corbett, W. J., 809.
 Corbutt, A. C., 677.
 Cordner, H. B., 40, 752, 757.
 Core, E. L., 741.
 Corl, C. F., 17, 697.
 Cortley, R. T., 521.
 Cormack, M. W., 482.
 Cornelson, A. H., 615.
 Corwin, E. F., 586.
 Cory, E. N., 74.
 Cory, V. L., 24, 89, 752.
 Costa, A. S., 65, 207, 635.
 Costa Neto, J. P. da, 778.
 Cottam, C., 218, 768.
 Cottam, W. P., 446, 447.
 Cottler, G. J., 89, 226.
 Cotton, W. E., 669.
 Cotton, W. P., 720.
 Cottrell, L. S., Jr., 834.
 Couch, J. N., 627, 791.
 Couch, J. R., 232, 796.
 Coulter, E. W., 728.
 Cover, S., 550, 836.
 Cowan, F. T., 361.
 Cowan, I. M., 535.
 Cowart, F. E., 463.
 Cowart, R., 60.
 Cowden, T. K., 256, 263, 265.
 Cowell, S. J., 842.
 Cowlin, R. W., 767.
 Cowsert, W. C., 89, 98, 403.
 Cox, A. B., 325.
 Cox, G. M., 466, 576.
 Cox, H. S., 564.
 Cox, J. A., 791.
 Cox, L. G., 766.
 Cox, R., 529.
 Cox, T. R., 327.
 Crafts, A. S., 329, 592.
 Craig, C. F., 100.
 Craig, J. F., 527.
 Craig, R., 74.
 Craig, R. A., 243.
 Craig, W. T., 751.
 Craige, A. H., Jr., 388.
 Craighead, F. C., 354, 626.
 Craigie, J., 631.
 Cralley, E. M., 630.
 Crampton, E. W., 228.
 Crandall, F. K., 188, 208.
 Crandall, L. A., 702.
 Crane, A. G., 5.
 Crane, J. C., 235.
 Crath, P. C., 363.
 Cravens, M. E., 827.
 Cravens, W. W., 512.
 Crawford, A. B., 669.
 Crawford, D. L., 790.
 Crawford, L. A., 288.
 Crawford, W. S., 264, 408.
 Creech, G. T., 672.
 Creech, S., 213.
 Creel, C. W., 144.
 Creighton, H. B., 17.
 Creighton, J. T., 494.
 Crew, F. A. E., 456.
 Crist, J. W., 184, 192.
 Cromer, C. O., 464, 575.
 Crooks, K. B. M., 781.
 Crosby, M. A., 540.
 Crosier, W., 469, 470, 480.
 Crosier, W. F., 202, 619.
 Cross, C. B., 752, 786.
 Cross, C. E., 384.
 Cross, F. B., 757.
 Cross, G. L., 311.
 Cross, W. E., 183.
 Crossley, D. I., 479.
 Crothers, H. M., 823.
 Crouch, E. K., 796.
 Croucher, H. H., 476.

- Crouley, R. U., 470.
 Crowdy, S. H., 481.
 Crowe, L. K., 100, 242, 667.
 Crowell, I. H., 201.
 Cruess, W. V., 269, 546, 547, 584.
 Cruikshank, J. W., 197.
 Culbertson, J. O., 827.
 Culbertson, J. T., 244.
 Cullinan, F. P., 620, 621.
 Cullison, A. E., 89, 658.
 Culton, T. G., 506, 510, 514.
 Cummings, M. B., 777.
 Cummings, R. W., 735.
 Cummins, G. B., 200, 778.
 Cunningham, A., 797.
 Cunningham, A. P., 141.
 Cunningham, H. S., 206.
 Cunningham, J. F., 144.
 Cupples, H. L., 493.
 Curran, H. R., 240.
 Currence, T. M., 472.
 Currie, G. A., 329.
 Curtis, A. C., 848, 854.
 Curtis, H. A., 291.
 Curtis, H. E., 15.
 Curtis, J. J., 466, 618.
 Curtis, L. C., 187.
 Curtis, O. F., 16.
 Curtis, P. B., 143, 729.
 Curtiss, W. M., 827.
 Curzon, E., 373.
 Cushman, R. A., 87, 372.
 Cutler, G. H., 178.
 Czarowitz, P. E., 325.
 Dack, G. M., 390.
 da Costa Neto, J. P., 778.
 da Cunha, A. G., 745.
 Daggs, R. G., 552.
 Daggy, R. H., 220.
 Dahl, A. S., 465.
 Dahlberg, A. C., 243, 809, 812.
 Dahlberg, G., 287, 858.
 Dahle, C. D., 100, 237, 517, 811.
 Dahms, R. G., 79, 786.
 Daigh, F. C., 71.
 Daines, R. H., 210, 628.
 Dalby, G., 161, 293.
 Dale, T., 412.
 Dalla Valle, J. M., 858.
 Dam, H., 139, 853.
 Dameron, W. H., 471, 752, 757.
 Dameshek, W., 284.
 D'Amour, F. E., 29.
 D'Amour, M. C., 29.
 Dana, B. F., 58, 351, 776.
 Daniel, E. P., 706.
 Daniel, G. E., 396.
 Daniels, L. B., 642.
 Daniels, Z. A., 635.
 Dann, W. J., 236.
 Darago, V., 661.
 Darby, C. W., 245.
 Darby, W. J., 844.
 Darkis, F. R., 203.
 Darling, H. M., 33, 178.
 Darling, L., 355.
 Darlington, H. T., 616.
 Darnell, A. L., 806.
 Darrow, G. M., 53, 342, 621, 622, 762, 763.
 Das Gupta, S. N., 200.
 da Silva, S. G., 200, 211.
 Daubenmire, R. F., 447.
 Daum, K., 137.
 DaVault, J. W., 257.
 Davenport, E., 721.
 David, P. R., 457.
 Davidson, J. A., 95.
 Davidson, J. B., 678.
 Davidson, J. M., 824.
 Davidson, O. W., 195.
 Davidson, R. W., 69, 311, 627, 637, 779.
 Davidson, W. A., 469.
 Davies, A. W., 281.
 Davies, F. R., 490.
 Davies, G. O., 527.
 Davies, H. R., 178.
 Davis, A. C., 499.
 Davis, B. H., 627.
 Davis, B. L., 7.
 Davis, C. C., 2, 686.
 Davis, C. L., 256.
 Davis, D., 546.
 Davis, E. M., 626.
 Davis, F. L., 35, 178, 320.
 Davis, G. E., 393, 451, 751, 794.
 Davis, G. K., 659.
 Davis, H. A., 656.
 Davis, H. J., 226, 804.
 Davis, H. P., 610.
 Davis, J. G., 294, 527, 730.
 Davis, J. J., 212, 359.
 Davis, J. S., 119, 685, 835.
 Davis, K., 300.
 Davis, K. C., 402.
 Davis, L. L., 49, 757.
 Davis, S. P., 856.
 Davis, W. A., 250.
 Davis, W. B., 855, 781, 782.
 Davis, W. C., 478.
 Davis, W. E., 16.
 Davison, V. E., 641.
 Dawsey, L. H., 360, 361.
 Dawson, A. B., 315.
 Dawson, J. B., 807.
 Day, D., 165.
 Day, E. L., 543.
 Day, G. M., 198.
 Day, H. G., 126, 706.
 Day, M. W., 626.
 Day, P. L., 844, 853.
 de Almeida, C. R. M., 764.
 Dean, G. A., 75.
 Deane, D. D., 242.
 Deaneasy, R., 174, 176.
 Dearborn, C. H., 186.
 Deay, H. O., 361.
 DeBoer, B., 462.
 Decker, C. W., 812.
 Decker, G. C., 643.
 Decker, P., 627, 760.
 Decker, S. W., 541.
 Decoux, L., 206.
 DeEds, F., 843.
 Deen, E., 329.
 Deen, O. T., 358.
 Deering, A. L., 144.
 Defago, G., 743.
 DeFrance, J. A., 36.
 De Hevesy, P., 689.
 Deighton, T., 232.
 de Jesus, Z., 533, 655, 673.
 de Kock, G., 814.
 DeLamater, E. D., 525.
 de la Torre-Bueno, J. R., 79.
 Delaune, E., 668.
 Delez, A. L., 243, 671.
 Delfs, E., 569.
 Delisle, A. L., 17.
 DeLoach, W. S., 306.
 DeLong, D. M., 76, 500.
 DeLong, H. H., 823.
 DeLong, W. A., 738.
 Delwiche, E. J., 484, 755.
 Demaree, A. L., 858.
 Demaree, J. B., 342.
 Demeter, K. J., 240.
 Demole, V., 714.
 Demolon, A., 168.
 de Moraes, A. T., 755.
 Dennison, R., 20.
 Denny, F. E., 18, 593.
 Denton, C. A., 95.
 Denny, D., 196.
 DeOme, K. B., 532.
 de Ong, E. R., 486.
 de Peralta, F., 60.
 Deppermann, C. E., 11.
 Dermen, H., 744.
 DeS. Brunner, E., 411.
 de Seabra, A. F., 789.
 Deslandes, J., 211.
 Dessyck, E. J., 582, 729.
 Dethier, V. G., 792.
 Detling, L. E., 592.
 DeTurk, E. E., 166.
 Deuber, C. G., 767.
 DeVault, S. H., 407.
 Dever, W. L., 490.
 de Villiers, E., 169.
 de Vries, A. H., 792.
 de Waal, H. L., 523, 814.
 Dewey, R. L., 687.
 Dexter, S. T., 90.
 Dey, F. L., 173.
 DeYoung, W., 156.
 Dhillon, G. S., 200.
 Diachun, S., 627, 634, 768.
 Diamond, H., 152.
 Diaz Pacheco, S., 124.
 Dice, J. R., 235, 720.
 Dick, J. B., 33, 63, 341.
 Dicker, G. H. L., 217.
 Dickerson, J. E., 185.

- Dickins, D., 429, 692.
 Dickinson, E. M., 389, 533.
 Dickson, B. T., 775.
 Dickson, R. C., 501, 647.
 Dickson, R. E., 299, 752, 795, 823.
 Diehl, L. F., 255, 692.
 Diehl, W. W., 199.
 Dietrich, H., 504, 786.
 Dietrich, K. S., 281.
 Dietz, C. F., 329, 399.
 Dimock, A. W., 488, 769.
 Dimock, W. W., 397.
 Dimond, A. E., 16, 627, 628.
 Dines, F. T., 752, 786.
 Dirks, H. B., 144.
 Dix, I. W., 475, 763.
 Doan, F. J., 237, 517, 521, 547.
 Dodd, A. P., 329.
 Dodds, G. S., 138, 842.
 Doerr, R., 631, 669.
 Dohanian, S. M., 648.
 Doig, W. T., 267.
 Dolby, R. M., 811.
 Dolecek, R. L., 510, 802.
 Donald, H. P., 509.
 Donelson, E. G., 415.
 Doneth, J. C., 682.
 Donnally, H. H., 843.
 Donoho, H., 256.
 Doob, H., 805.
 Doran, W. L., 478, 758.
 Doremus, H. M., 399.
 Dorfman, R. I., 611.
 Dorman, C., 15, 141, 302, 319, 372, 430, 578.
 Dornbush, A. C., 664, 848.
 Dorrell, W. W., 627.
 Dorsey, C. K., 224.
 Doss, M. A., 523.
 Doten, S. B., 148, 464.
 Doty, D. M., 150.
 Doty, J. R., 801.
 Doucette, C. F., 493.
 Dougherty, L. A., 263, 635.
 Dougherty, R. W., 388.
 Douglas, H. C., 603.
 Douglass, A. E., 296, 454.
 Dow, G. F., 265.
 Dow, R., 779.
 Dowden, P. B., 654.
 Down, H. H., 324.
 Downes, W., 642.
 Downs, P. A., 100, 386.
 Dowson, W. J., 771.
 Doyle, L. P., 243.
 Drain, B. D., 54, 198.
 Drake, C. J., 217, 499, 645.
 Drake, M., 178.
 Drake, R. E., 442.
 Drake, V., 470.
 Drake, C. H., 632.
 Dravid, R. K., 738.
 Drechsler, C., 212.
 Dreesen, W. H., 113.
 Dreesen, W. C., 78.
 Dreis, T., 429.
 Drews, E. A., 500.
 Drigalski, W. v., 279.
 Drosdoff, M., 738.
 Drummond, J. C., 694, 701.
 Drummond, L. W., 144.
 Drummond-Goncalves, R., 634.
 Dry, F. W., 28.
 DuBois, K. P., 524.
 du Buy, H. G., 16, 162, 448, 629.
 Duche, A., 159, 741.
 Duckworth, J., 518.
 Dudley, F. J., 232, 233, 381.
 Dudley, H. C., 644.
 Dudley, J. E., Jr., 364.
 Duffee, F. W., 662, 678, 755.
 Dugas, A. L., 358.
 Duggar, B. M., 16, 629.
 Duggar, J. F., 33.
 Duis, W. H., 758.
 Dummeler, E. F., 681.
 Dunbar, C. O., 471.
 Dunbar, J., 702.
 Duncan, A. O., 231.
 Duncan, C. W., 383.
 Duncan, H. R., 230, 506.
 Duncan, I. J., 758.
 Duncan, L. N., 144.
 Duncan, O. D., 266, 690, 692, 834.
 Dundas, B., 58.
 Duneagan, J. C., 768, 769, 772.
 Dunez, A., 168.
 Dunkelberg, G. H., 178.
 Dunkle, P. B., 752.
 Dunlap, A. A., 325, 342, 770.
 Dunlap, G. L., 391.
 Dunlavy, H. E., 752.
 Dunmore, F. W., 152, 586.
 Dunn, L. C., 172, 606.
 Dunnam, E. W., 494.
 Dunnwald, T. J., 13, 400.
 Dunning, R. G., 777.
 Durant, A. J., 253.
 Durrell, L. W., 343, 347, 627.
 Dustman, R. B., 758, 796, 807.
 Dutcher, R. A., 507, 849.
 Dutky, S. R., 503.
 du Toit, P. J., 372, 873.
 Dutt, B. K., 446.
 Dutton, H. J., 16.
 du Vigneaud, V., 133, 274.
 Dye, M., 271.
 Dyer, H. M., 133.
 Dykstra, T. F., 64, 627.
 Eades, H. W., 731.
 Eagleson, C., 74, 648.
 Eakin, R. E., 22, 233.
 Earl, H. H., Jr., 789.
 Earle, A., 693.
 Earnest, E., 593.
 Easter, S. S., 652.
 Eastwood, T. M., 185.
 Eaton, A. G., 801.
 Eaton, F. M., 737.
 Eaton, J. W., 691.
 Eaton, R. J., 779.
 Eaves, C. A., 209.
 Ebeling, W., 644.
 Ebling, W. II., 682.
 Ebright, V. E., 422, 552.
 Eckerson, S. II., 16.
 Eckert, J. E., 505, 654.
 Eckhardt, R. C., 466, 604, 614.
 Eddie, B., 393.
 Eddy, C. O., 357, 358.
 Eddy, G. W., 221.
 Edgerton, C. W., 207.
 Edgerton, L. F., 49.
 Edgerton, L. J., 701.
 Edin, H., 656.
 Edmond, J. B., 178.
 Edwards, A. D., 862.
 Edwards, E. E., 686.
 Edwards, E. T., 346.
 Edwards, P. R., 103, 397, 535, 821.
 Efferson, J. N., 116, 403, 409, 830.
 Eggers, V., 16, 17, 18, 628.
 Eggert, R. L., 192.
 Eggleton, F. E., 595.
 Eiler, F. E., 741.
 Ehrlich, J., 488.
 Elchel, B., 596.
 Eichhorn, A., 669.
 Eichhorn, E. A., 251, 388.
 Eichler, W., 788.
 Eichmann, R. D., 363, 642, 645.
 Eide, C. J., 351, 472.
 Eigesti, O. J., 310, 454.
 Einarson, L., 714.
 Eisele, C. W., 698.
 Eisenbrandt, L. L., 252.
 Eisenhower, M. S., 687.
 Eisenmenger, W. S., 551.
 Ekbaum, E. K., 103.
 Eke, P. A., 402.
 Ekeberg, M. D., 576.
 Ekstrom, V. A., 408.
 Eldridge, K. E., 150.
 Elford, W. J., 669.
 Eliason, E. J., 197, 477.
 Elliot, C. W., 259.
 Ellenwood, C. W., 51.
 Ellinger, P., 602.
 Elliott, C., 627.
 Elliott, F. F., 686.
 Elliott, F. I., 747.
 Elliott, M. C., 715.
 Ellis, E. L., 21.
 Ellis, G. H., 142, 795, 805.
 Ellis, M., 202.
 Ellis, N. K., 185.
 Ellis, N. R., 798, 800.
 Ellis, R. P., 781.
 Ellison, E. S., 298.
 Ellisor, L. O., 358, 859, 498.
 Ellsworth, L. D., 311.

- El Sadr, M. M., 281, 583.
 Elsasser, W. M., 442.
 Elson, J., 736.
 Elvegard, E., 585.
 Elvehjem, C. A., 132, 276,
 413, 421, 553, 556, 563,
 660, 664, 669, 693, 707,
 801, 803, 807, 840, 851.
 Embree, E. R., 687.
 Emerson, G. A., 228, 561.
 Emerson, K. C., 221.
 Emerson, O. H., 561.
 Emerson, R. A., 759, 769.
 Emmart, E. W., 445.
 Emmel, M. W., 108, 251, 508.
 Emmens, C. W., 173, 174.
 Emmett, A. D., 714, 715.
 Emmons, C. W., 523.
 Emmons, G., 585.
 Endo, S., 346.
 Engelbert, V., 467.
 Engelbrecht, M. A., 393.
 Engler, K., 677.
 Englerth, G. H., 780.
 Englis, D. T., 731, 840.
 Engli h, L. L., 73.
 English, P. F., 491, 495.
 Englund, E., 687.
 Ensminger, D., 266.
 Ensminger, L. E., 298.
 Entenman, C., 32, 33.
 Enzie, W. D., 185, 618, 619.
 Epling, C., 593.
 Epple, W. F., 234, 285.
 Epps, E. A., 182.
 Eppson, H. F., 101, 307.
 Erdman, L. W., 35, 178, 598.
 Erf, L. A., 808.
 Ergle, D. R., 348.
 Erickson, A. B., 214, 535.
 Erickson, E. L., 752.
 Erickson, F. J., 584.
 Erickson, H. D., 827.
 Eriksen, A., 402.
 Erikson, S. E., 144.
 Errington, B. J., 388.
 Errington, P. L., 356, 782.
 Esau, K., 455, 600.
 Eshbaugh, F. P., 331.
 Eskey, C. R., 392.
 Espe, D., 662.
 Espinasse, P. G., 607.
 Esplin, A. C., 374, 657.
 Esselen, W. B., Jr., 551, 561.
 Essig, E. O., 431, 642.
 Esteve, C., Jr., 328.
 Ettasvold, W. L., 118, 287,
 536.
 Evans, C. A., 93, 491.
 Evans, F. E., 240.
 Evans, H. M., 228, 316, 458,
 561, 582.
 Evans, R. E., 229.
 Evans, R. M., 70.
 Evans, W. M., R., 72, 73.
 Eveleth, D. F., 814, 819.
 Evenden, J. C., 647.
 Everett, E. K., 325.
 Everett, J. W., 460.
 Everitt, E. L., 524.
 Evers, O. R., 765.
 Everson, G., 693.
 Eversull, F. L., 144.
 Everts, G. S., 388.
 Ewart, W. H., 786.
 Eyer, J. R., 649.
 Eyster, H. C., 16, 597.
 Ezekiel, M., 681.
 Ezekiel, W. N., 325, 342, 770.
 Faber, H. K., 696.
 Fabian, F. W., 584, 679, 698,
 733.
 Fabricius, N. E., 98, 810.
 Fagan, F. N., 471.
 Fahey, J. E., 212.
 Fairbanks, B. W., 373, 657.
 Fajardo, T. G., 60.
 Falcon, P. R., 220.
 Falconer, J. I., 110, 259, 827.
 Fales, J. H., 643.
 Fallscheer, I., 649.
 Fantus, B., 850.
 Farioletti, M., 686.
 Farish, L. R., 46, 330.
 Farmer, C. J., 566.
 Farnsworth, H. C., 542, 685.
 Farquharson, J., 528.
 Farr, W. K., 593, 600.
 Farrar, J. L., 767.
 Farrar, M. D., 216, 643.
 Farrar, R. R., 241.
 Farrell, F. D., 1, 144.
 Farris, N. F., 471.
 Fassett, N. C., 158.
 Fatzer, A. S., 425.
 Faulks, E. B., 197.
 Faust, E. C., 100.
 Fawcett, H. C., 772.
 Fawcett, H. S., 635, 636.
 Fawcett, K. I., 185, 254.
 Fay, A. C., 240, 664.
 Fedde, M. S., 144.
 Feeney, E. E., 693.
 Fehmerling, G. B., 336.
 Feterabend, L., 110.
 Fein, H. D., 708, 850.
 Feiner, R. R., 283.
 Feldman, W. H., 244, 530.
 Felix, E. L., 628.
 Fellers, C. R., 170, 551, 561,
 837.
 Fellows, H., 59.
 Fels, S. S., 749.
 Felt, E. P., 212, 216, 497.
 Felton, M. W., 288.
 Fenn, F. U., 795.
 Fenne, S. B., 345, 489.
 Fenstermacher, R., 389.
 Fenton, F. A., 79, 80, 365,
 752, 786, 789.
 Ferguson, F. F., 306, 453.
 Ferguson, J., 394.
 Ferguson, L. C., 388, 527.
 Ferguson, M. S., 309.
 Ferguson, W. C., 75, 76.
 Fernando, M., 634.
 Ferrant, N. A., Jr., 37.
 Ferrière, C., 372.
 Feutz, F., 241.
 Ficht, G. A., 212, 219.
 Fiene, A. R., 103.
 Fieser, L. F., 439, 440.
 Fifield, W. M., 473.
 Filing, G. A., 333.
 Finch, A. H., 55.
 Fincher, M. G., 747.
 Finck, E. von, 788.
 Fincke, M. L., 418, 424.
 Findlay, G. M., 631, 669.
 Findlen, P. J., 827.
 Finerty, J. C., 317.
 Finkelstein, H., 531, 675.
 Finley, J. P., 297.
 Fischer, G. W., 482, 630.
 Fischer, W., 58.
 Fisher, C. D., 440.
 Fisher, C. E., 299, 752, 823.
 Fisher, D. V., 333, 334.
 Fisher, E. H., 80.
 Fisher, H., 628.
 Fisher, H. J., 729.
 Fisher, R. A., 357, 359, 653.
 Fisk, F. W., 642.
 Fiske, J. G., 470.
 Fister, L. A., 54.
 Fitch, C. P., 390.
 Fitzgerald, D. V., 791.
 Fitzgerald, G. A., 561.
 Flake, J. C., 664, 665.
 Flanders, S. E., 357, 365, 505,
 642, 651.
 Fleming, C. E., 464.
 Fleming, W. E., 357.
 Fleming, F., 16.
 Fletcher, C. C., 592.
 Fletcher, R. K., 787.
 Fletcher, S. W., 4, 5, 148, 575,
 580.
 Fiegelman, M. T., 715.
 Flinn, F. B., 700.
 Flint, L. H., 17.
 Flint, W. P., 53, 216, 358,
 643.
 Flor, H. H., 63.
 Flory, W. S., Jr., 186, 757.
 Floyd, E. H., 357, 358, 647.
 Floyd, W. W., 423.
 Fluke, C. L., 785.
 Flynn, J. E., 568.
 Fogelberg, N., 832.
 Fogelberg, S. O., 628.
 Foggia, A., 817.
 Foister, C. E., 630.
 Folley, S. J., 233, 385.
 Folson, M. T., 426.
 Foltz, V. D., 386.
 Fong, J., 162.
 Fong, W. L., 12, 297.
 Foord, D. C., 240.
 Foot, A. S., 517.

- Forbes, E. B., 495, 507, 782.
 Forbes, I. L., 207.
 Forbes, R. H., 141.
 Forbush, E. H., 213.
 Ford, G. S., 719.
 Ford, O. W., 185, 366, 582.
 Fore, J. M., 219, 227, 254, 255.
 Fornachon, J. C. M., 603.
 Forster, R., 65.
 Forster, T. L., 664.
 Fort, C. A., 468.
 Fort, M., 201.
 Fortin, L. de G., 508.
 Foss, H., 321.
 Foster, A. O., 531.
 Foster, A. S., 311.
 Foster, E. A., 687.
 Foster, E. M., 520, 663.
 Foster, J. W., 603.
 Fothergill, L. D., 530.
 Fountaine, F. C., 316.
 Fourie, P. J. J., 523, 524.
 Fourt, D. L., 316, 383, 389.
 Fourt, L. A., 16.
 Fouts, E. L., 806.
 Fraenkel-Conrat, H., 458.
 Frahm, E. E., 743.
 Frampton, V. L., 628, 776.
 France, R. L., 745.
 Francioni, J. B., Jr., 226.
 Francis, C. C., 844.
 Francis, G. M., 833.
 Franck, J., 309.
 Frandsen, H. N., 321.
 Frandsen, J. H., 551.
 Frank, H. A., 569.
 Frank, R. T., 318.
 Frankenfield, J. C., 358.
 Franklin, A. V., 397.
 Franklin, B. A., 260.
 Franklin, H. J., 334.
 Franssen, C. J. H., 654.
 Franze, C. S., 752.
 Fraps, G. S., 89, 231, 302, 423, 445, 582, 727, 735, 752, 796, 806, 836.
 Fraps, R. M., 510.
 Frary, G. G., 729.
 Fraser, A. H. H., 396.
 Fraser, H. F., 564.
 Frazier, C. N., 317.
 Frazier, W. A., 45, 187.
 Frazier, W. C., 455, 520, 663.
 Frear, D. E. H., 480, 495, 496.
 Fredericia, L. S., 560.
 Frederick, E. B., 507.
 Fredine, G., 860.
 Free, G. E., 13.
 Freed, S. C., 175.
 Freedman, E., 717.
 Freeman, M. E., 839.
 Freeman, T. R., 806.
 Freeman, V. C., 144.
 Freising, J. H., 627, 789.
 French, C. E., 782.
 French, C. S., 16,
 French, G. T., 356.
 French, L. R., 842.
 French, M. H., 229, 313, 656.
 French, R. B., 564.
 Frey, C. N., 171.
 Frezzi, M. J., 488.
 Frick, D. M., 499.
 Fried, K., 329.
 Friedgood, H. B., 315.
 Friedman, G. S., 29.
 Friedman, M. H., 29.
 Friedman, S. M., 609.
 Friend, W. H., 752, 757.
 Friesner, R. C., 447, 450.
 Friley, C. E., 144.
 Fritz, E., 296.
 Fritz, J. C., 510.
 Fritz, R. F., 498.
 Frobisher, M., Jr., 23.
 Froilano de Mello, I., 228.
 Frost, D. V., 276, 421, 553, 801.
 Frost, H. B., 337.
 Frost, W. D., 393.
 Fry, E. G., 697.
 Fry, F. E. J., 595.
 Fudge, B. R., 336.
 Fudge, J. F., 231, 727, 735.
 Fugo, N. W., 173, 608.
 Fuhrman, F. A., 675.
 Fulbright, J. W., 144.
 Fuller, F. D., 656, 796.
 Fuller, H. K., 610.
 Fuller, H. U., 297.
 Fuller, J. E., 124, 603.
 Fuller, W. H., 21.
 Fulton, B. B., 74, 506.
 Funchess, M. J., 141, 144.
 Furry, M. S., 572, 573.
 Gaarenstroom, J. H., 32.
 Gabbard, L. P., 828.
 Gäbler, H., 788.
 Gabrielson, I. N., 492.
 Gadd, J. D., 338.
 Gadre, K. M., 11.
 Gaessler, W. G., 759.
 Gaffron, H., 16, 17.
 Gaigerov, S. S., 153.
 Gaines, J. C., 73, 787.
 Gaines, J. G., 627.
 Gaines, R. C., 86, 357, 371, 494.
 Gaines, W. L., 385.
 Gainey, P. L., 169, 204.
 Gale, E. F., 603.
 Gallenne, J. H., 442.
 Galley, H. W., 182.
 Galloway, A. G., 643.
 Galloway, H. M., 479.
 Gallup, W. D., 98, 795, 806.
 Galpin, S. L., 738.
 Gamble, M. T., 694.
 Gambrell, F. L., 647.
 Gangulee, N., 548.
 Gannon, A., 226.
 Gapuz, D. B., 666.
 Gapuz, R. B., 500, 655.
 Garcia, E. H., 448.
 Garcia, L. A. A., 638.
 Gardiner, M. S., 452.
 Gardner, F. E., 50.
 Gardner, K. E., 805.
 Gardner, M. W., 769.
 Gardner, R., 157.
 Gardner, T. R., 503.
 Gardner, V. R., 144, 190, 674.
 Gardner, W., 078.
 Garey, J. C., 520, 663.
 Garland, H., 57.
 Garman, P., 73.
 Garner, W. W., 309.
 Garnett, W. E., 266.
 Garrett, A. O., 446.
 Garrison, C. S., 737.
 Garrison, G. L., 371, 494.
 Garrison, O. B., 178.
 Garver, H. L., 826.
 Gary, W. Y., 582.
 Gaskill, J. O., 64.
 Gassner, F. X., 388, 510, 511, 671.
 Gassner, G., 778.
 Gates, F. C., 341.
 Gauch, H. G., 756.
 Gauger, H. C., 613.
 Gault, L., 15.
 Gaumann, E., 593.
 Gausson, H., 734.
 Gaut, R. C., 410.
 Gavin, G., 709.
 Gaylord, F. C., 178, 185.
 Geary, J. M., 700.
 Gelb, W. J., 156.
 Geiger, A., 728.
 Geissler, G. H., 357.
 Gendreau, L. A., 610.
 Generoso, J. D., 676.
 Gentner, L. G., 367.
 Genung, A. B., 686.
 George, J. J., 734.
 George, W., 396.
 Georgi, C. E., 170.
 Gerbracht, D., 471.
 Gerdes, F. L., 325.
 Gericke, S., 759.
 Gerlaugh, P., 90, 91, 755, 799.
 Gerlough, T. D., 102.
 Germani, P., 256.
 Gernert, W. B., 752.
 Gershon-Cohen, J., 749.
 Gessner, A. A., 267, 384.
 Gettys, W. E., 688.
 Ghatak, P. N., 200.
 Gibbons, N. E., 379, 380.
 Gibbons, W. H., 687.
 Gibbs, J. B., 411.
 Gibson, A., 642.
 Gibson, C. A., 311.
 Gibson, G. W., 636.
 Gibson, W. L., Jr., 258, 683.
 Giddings, N. J., 58, 627.
 Gieger, M., 372.
 Gilbert, B. E., 141, 329.

- Gilbert, C. S., 307.
 Gilchrist, G., 144.
 Gildow, E. M., 316, 372, 389.
 Gile, B. M., 405.
 Giles, L. W., 492.
 Gill, J. B., 494.
 Gilling, W. S., 303.
 Gillette, C. P., 576.
 Gilmer, P. M., 494.
 Gilmore, J. U., 493.
 Gini, E., 604.
 Glibel, G., 321.
 Giri, C. K. V., 424.
 Girth, H. B., 655.
 Gish, C. L., 511.
 Gladwin, F. E., 142.
 Glaser, R. W., 103, 655.
 Glasgow, H., 789.
 Glass, E. H., 781.
 Glass, L. C., 607.
 Glassey, T. W., 13.
 Glavind, J., 139, 853.
 Glazier, M. M., 695.
 Gleissner, B. D., 495, 648.
 Glickstein, M., 551.
 Glindeman, P., 693.
 Glover, L. C., 860.
 Glover, P. E., 159.
 Glover, E. E., 817, 821.
 Glover, W. O., 205.
 Gluecksohn-Schoenheimer, S., 172, 818.
 Gnosselin, A., 294.
 Godden, W., 518.
 Godfrey, A. B., 314, 511.
 Godfrey, G. H., 489, 735, 770.
 Godoy, M. F., 485.
 Goettsch, M., 373.
 Goff, C. C., 73.
 Goff, O. E., 95, 106, 510, 532.
 Gold, N. L., 542.
 Goldfaden, M. F., 551.
 Goldin, H. S., 318.
 Goldin, M. I., 635.
 Golding, F. D., 358.
 Golding, N. S., 240, 242.
 Golding, W. V., 95.
 Goldman, L., 852.
 Gomez, F., 229.
 Gómez, L. A., 764.
 Gonçalves Carneiro, J., 487.
 Gonçalves da Cunha, A., 745.
 Gonçalves da Silva, S., 342.
 Goncalves, B. D., 634.
 Gonce, J. E., Jr., 801.
 Goodding, L. N., 211.
 Goodey, T., 639.
 Goodhart, R., 704.
 Goodhue, L. D., 643.
 Gooding, P. H., 226.
 Goodpasture, E. W., 107.
 Goodrich, A. L., Jr., 73.
 Goodrum, P. D., 355.
 Goodsell, W. D., 681.
 Goodwin, C. W., 603.
 Goodwin, D. C., 687.
 Goodwin, M. W., 6, 627, 782.
 Goot, P. van der, 217.
 Gopal Rao, S., 11.
 Gordon, A. S., 175.
 Gordon, C. D., 510.
 Gordon, E. S., 707.
 Gordon, H. M., 248, 672.
 Gordon, W. G., 125.
 Gore, U. R., 614.
 Gorer, P. A., 102.
 Gorini, C., 239.
 Gortner, R. A., Jr., 417.
 Goss, H., 459.
 Goss, M. J., 727.
 Goss, W. L., 469.
 Götz, B., 768.
 Gould, C. J., Jr., 59.
 Gould, E., 357.
 Gould, G. E., 212, 358, 359, 361.
 Gould, I. A., 97, 386, 665, 667.
 Goulden, C. H., 287.
 Gourley, J. H., 50.
 Gowen, J. W., 635.
 Graber, L. F., 324.
 Grace, N. H., 62, 330, 339, 452, 767.
 Graham, C., 74.
 Graham, E., 293.
 Graham, J. J. T., 729.
 Graham, L. T., 358, 649.
 Graham, R., 249, 391, 392, 594, 815.
 Graham, T. W., 59.
 Grahame, T., 897.
 Grand-Court, C. Grivot, 206.
 Grandel, F., 584.
 Grandfield, C. O., 324.
 Graner, E. A., 310.
 Granovsky, A. A., 628, 789.
 Graphius, J. E., 720.
 Grattan, G. E., 731.
 Grattan, J. F., 80.
 Graubard, M., 30.
 Graubard, M. A., 119.
 Graul, E. J., 682.
 Gravatt, A. E., 478.
 Gravatt, G. F., 637.
 Graves, A. H., 637, 780.
 Graves, E., 719.
 Graves, P. H., 398.
 Graves, R. R., 807.
 Gray, E. L., 701.
 Gray, G. E., 757.
 Gray, H., 696.
 Gray, H. F., 219.
 Gray, L. C., 687.
 Gray, R. B., 826.
 Greathouse, G. A., 603, 633, 770, 771.
 Greaves, E. O., 23.
 Greaves, J. E., 23, 725.
 Green, D. E., 10.
 Green, L. F., 150.
 Green, P. L., 410.
 Green, R. G., 93, 491.
 Green, R. M., 144.
 Green, W. W., 315.
 Greenbank, G. R., 236.
 Greenbaum, R. S., 850.
 Greenberg, D. M., 137, 552, 554.
 Greenberg, S. M., 731.
 Greene, H. S. N., 314.
 Greene, P. S., 144.
 Greene, R. E. L., 682.
 Greene, R. E., 174, 460, 750.
 Greenlaw, J. P., 267.
 Greensaft, M., 106.
 Greenwood, A. W., 608.
 Greep, R. O., 458, 749.
 Gregory, C. T., 347, 350.
 Gregory, P. H., 636.
 Gregory, P. W., 388, 819.
 Gregory, R. A., 153.
 Gregory, W. C., 598.
 Greiner, J. B., 254.
 Greite, W., 749.
 Gray, C. G., 338.
 Griffee, F., 147.
 Griffin, F. P., 510.
 Griffin, S. W., 364.
 Griffith, H. D., 128.
 Griffith, R. L., 359.
 Grigsby, H. D., 729.
 Grigsby, S. E., 266.
 Grimes, F. G., 213.
 Grimes, J. C., 89.
 Grimes, M. A., 855.
 Grinnells, C. D., 236.
 Griswold, G. H., 786.
 Griswold, R. M., 270.
 Grivot Grand-Court, C., 206.
 Grizzard, A. L., 178, 754.
 Groat, R. A., 18.
 Groom, J. L., 367.
 Groome, J. R., 318.
 Gross, A. E., 489.
 Gross, E. W., 161.
 Gross, H. N., 67.
 Gross, P. M., 203.
 Gruenhagen, E. H., 340.
 Grundmann, A. W., 674.
 Grundy, W. E., 745.
 Grüneberg, H., 606.
 Guard, A. T., 478.
 Gubin, S. N., 687.
 Gudjonsson, S., 560.
 Guerrant, N. B., 507, 849.
 Guha, R. C., 131.
 Guha-Thakurta, A., 446.
 Guildry, W., 668.
 Guilbert, H. R., 795.
 Guin, M., 405, 430.
 Guiscafé-Arrillaga, J., 764.
 Gull, P. W., 319.
 Gunderson, H., 652, 789.
 Gunness, C. I., 586.
 Gunsalus, I. C., 747, 805.
 Gupta, R. L., 788.
 Gupta, S. N. Das, 200.
 Gustafson, F. G., 16, 19.
 Gustafson, Y., 588.
 Gustavson, R. G., 511.

- Guthrie, E. S., 99, 521, 805, 810.
 Guthrie, J. D., 16, 17, 19.
 Guthrie, J. E., 251, 532.
 Guthrie, M. J., 316.
 Guyton, F. E., 82, 494.
 Gwatkin, R., 231, 250.
 Gwin, J. M., 511.
 György, P., 284, 285, 286, 567, 709.
- Haas, A. R. C., 336.
 Haas, V. H., 392.
 Haasis, F. A., 642, 769.
 Haber, E. S., 331, 557, 759.
 Haberman, S., 311.
 Habermann, B. T., 105, 531.
 Hackbarth, J., 760.
 Haddock, J. L., 614.
 Hadro, G. J., 551.
 Hady, F. T., 406.
 Haegeler, R. W., 357.
 Haenseler, C. M., 628.
 Haessler, G. J., 58, 502.
 Hafer, L. F., 153.
 Hafner, F. H., 510.
 Hafstad, K. C., 441.
 Haggerty, J. J., 829.
 Hagmann, L. E., 786.
 Hahn, H. C., 752.
 Haig, D., 523.
 Haines, R. B., 93, 660.
 Halcro Wardlaw, H. S., 548.
 Haldane, J. B. S., 604.
 Hale, E. B., 383.
 Hale, F., 796.
 Hale, J. M., 298.
 Hale, W. S., 43.
 Haley, D. E., 464, 480, 481.
 Haley, W. E., 358.
 Hall, A. C., 18, 602.
 Hall, A. R., 736.
 Hall, D. L., 248.
 Hall, G. O., 747.
 Hall, O. J., 118.
 Hall, R. A., 752, 795.
 Hall, W. J., 251, 389.
 Hallauer, C., 631, 669.
 Haller, H. L., 642.
 Hallman, E. T., 388, 675.
 Hallock, H. C., 221.
 Halma, F. F., 54.
 Halperin, L., 484.
 Halpin, J. G., 755.
 Halversen, W. V., 298, 389, 398.
 Halverson, J. O., 659.
 Ham, W. E., 94.
 Ham, W. T., 687.
 Hamann, H. G. F., 510.
 Hambidge, G., 687.
 Hamerstrom, F., 356.
 Hamerstrom, F. N., Jr., 356.
 Hamilton, A. B., 403.
 Hamilton, C. H., 688, 828.
 Hamilton, C. L., 108.
 Hamilton, H. S., 481.
- Hamilton, J. B., 749.
 Hamilton, J. M., 66, 351.
 Hamilton, T. S., 726, 842.
 Hamilton, W. J., Jr., 70, 492, 781.
 Hamlin, J. C., 86, 785.
 Hammar, C. H., 115, 537, 828.
 Hammer, B. W., 240, 241, 522.
 Hammond, H. P., 144.
 Hammond, J., 231, 609, 794, 798.
 Hammond, J. C., 803.
 Hammond, J. W., 303, 729.
 Hammond, P. H., 144.
 Hamner, C. L., 431.
 Hamner, K. C., 142, 305.
 Hampton, B. C., 392.
 Hamre, C. J., 551.
 Hand, D. B., 521, 751, 805, 810.
 Hangas, A., 260.
 Hankins, T. H., 326.
 Hankinson, D. J., 293.
 Hanna, W. J., 759.
 Hannah, H. W., 540.
 Hannah, J. A., 861.
 Hannay, A. M., 287, 262, 411, 546, 832.
 Hansberry, R., 360.
 Hansberry, T. R., 786.
 Hansbrough, J. R., 637.
 Hansen, A. E., 416.
 Hansen, D., 612, 655.
 Hansen, H. C., 383.
 Hansen, H. N., 58, 59, 342.
 Hansen, J., 321.
 Hansen, N. E., 338, 757.
 Hansing, E. D., 769.
 Hanson, A. M., 582.
 Hanson, F. E., 806.
 Hanson, H. H., 143.
 Hanson, J. J., 818.
 Hanson, L. E., 288, 795.
 Hanson, S., 793.
 Haralson, F. E., 760.
 Hardell, R. E., 241.
 Hardenburg, E. V., 467, 751.
 Hardin, C. M., 263.
 Hardin, L. J., 303.
 Harding, T. S., 687.
 Hardy, J. I., 139.
 Hardy, M. B., 211.
 Hardy, W. T., 795, 814.
 Haring, C. M., 388.
 Harlan, A. D., 226.
 Harland, S. C., 446.
 Harley, C. P., 761.
 Harman, M. T., 136.
 Harman, S. W., 86, 215.
 Harmer, P. M., 330.
 Harms, A., 510, 511.
 Harmston, F. C., 221, 503, 787, 792.
 Harned, B. K., 609.
 Harney, P. J., 585.
 Harper, C., 227.
 Harper, F. A., 287, 827.
- Harper, H. J., 179, 752.
 Harper, R. E., 752.
 Harlar, E. S., 341.
 Harrar, J. G., 627, 628, 781, 790, 791.
 Harrell, D. C., 177.
 Harrington, F. M., 612, 617.
 Harrington, J. B., 43.
 Harris, I., 690.
 Harris, L. J., 274.
 Harris, M., 325, 401, 855.
 Harris, R. H., 42.
 Harris, R. V., 585, 635.
 Harris, S. G., 837.
 Harris, W. C., 241.
 Harrison, A. L., 770.
 Harrison, B. F., 446.
 Harrison, E. S., 747, 805.
 Harrison, F., 144.
 Harrison, P. K., 357.
 Harrison, T. H., 585.
 Harsh, R., 174.
 Harshaw, H. M., 510, 516.
 Harshbarger, K. E., 384.
 Hart, E. B., 276, 413, 421, 553, 662, 663, 664, 669, 693, 801, 803, 807.
 Hart, F. L., 729.
 Hart, G., 582.
 Hart, L., 253.
 Harter, L. L., 629.
 Hartman, E. L., 757.
 Hartman, H., 339.
 Hartman, J. D., 178, 185, 188.
 Hartsell, S. E., 532.
 Hartwig, H. B., 751.
 Hartzell, A., 700.
 Hartzell, F. Z., 648.
 Harvey, R. B., 628.
 Harvey, W. A., 739.
 Harvill, E. K., 337.
 Harwood, P. D., 251.
 Hasek, R., 194.
 Haskell, R. J., 750.
 Haskins, A. L., 471.
 Haskins, A. L., Jr., 611.
 Hassall, A., 523.
 Hastings, A. B., 608.
 Hastings, E. G., 97, 669.
 Haterlus, H. O., 173.
 Hathaway, C. O., 453.
 Hatswell, J. M., 456.
 Hatton, J. H., 70.
 Hauck, C. W., 110, 264, 269.
 Hauge, S. M., 227, 228, 234, 235.
 Haut, I. C., 59, 763.
 Haver, F. E., Jr., 25.
 Havis, A. L., 760.
 Hawker, L. E., 636.
 Hawkins, B. S., 627.
 Hawks, E. B., 143.
 Hawks, J. E., 271.
 Hawley, H., 151.
 Hawthorn, L. R., 188, 757, 836.

- Hay, J. R., 388.
 Hay, W. D., 470.
 Hayatsu, S., 403.
 Hayden, C. E., 388.
 Hayes, H. K., 20, 27.
 Hays, F. A., 457, 463, 510, 608.
 Hays, J. R., 256, 259.
 Hayward, J. W., 182, 510.
 Hazen, N. W., 540.
 Hazlewood, B. P., 230.
 Headington, R. C., 827.
 Heald, F. D., 199.
 Healy, J. S., 669.
 Heard, C. E., 787.
 Hechter, O., 175.
 Hedges, F., 628.
 Heflebower, R. B., 681.
 Hegner, R., 253.
 Hegsted, D. M., 669, 803.
 Heid, J. L., 732.
 Heidt, L. J., 18, 602.
 Heikertinger, F., 788.
 Helmsch, C., Jr., 24.
 Heinemann, B., 294.
 Heinicke, A. J., 24, 51, 66, 209, 761.
 Heinze, K., 775.
 Heishman, J. O., 395.
 Heit, C. E., 197, 477, 651, 793.
 Helzer, E. E., 173.
 Helgeson, E. A., 161, 184, 307, 471.
 Hellbaum, A. A., 749.
 Hellberg, A., 656.
 Hallebrandt, F. A., 843.
 Heller, A., 812.
 Heller, V. G., 757, 795, 802.
 Hellman, L. M., 569.
 Hellmers, H., 491.
 Helm, C. A., 754.
 Hely, P. C., 647.
 Hemingway, A., 170.
 Henderson, D. W., 102.
 Henderson, E. W., 511.
 Henderson, H. O., 806.
 Henderson, J. A., 815.
 Henderson, J. M., 220.
 Henderson, L. M., 693.
 Henderson, M. T., 326.
 Henderson, R. G., 628.
 Hendricks, J. W., 616.
 Hendricks, S. B., 293.
 Hendrickson, A. H., 52.
 Hendrickson, G. O., 783.
 Henley, R. E., 671.
 Hennefrund, H. E., 544.
 Henney, H. J., 860.
 Henning, G. F., 263.
 Henning, M. W., 523.
 Henning, W. L., 506.
 Henrici, A. T., 595.
 Henry, A. M., 729.
 Henry, B. W., 482.
 Henry, H. K., 651, 793.
 Henry, K. M., 518, 519, 533.
 Henry, W. A., 862.
 Hensel, R. L., 752.
 Hanson, L., 178, 344.
 Herb, M. L., 542.
 Hermes, W. B., 219.
 Herrera y Garmendia, F. L., 159.
 Herrick, J., 70.
 Herrington, B. L., 805.
 Herrmann, O. W., 685.
 Hertig, M., 358.
 Herzner, F. H., 98, 141.
 Hess, C. W., 510.
 Hessler, L. E., 348.
 Hester, H. R., 249, 391, 822.
 Hester, J. B., 332, 472.
 Hetzer, H. O., 172.
 Heuberger, J. W., 342, 344, 628.
 Heukelekian, H., 312.
 Heuser, G. F., 94, 151, 510, 514, 802.
 Hevesy, P. de, 689.
 Hewitt, J. L., 58.
 Hewitt, R., 214.
 Hewitt, W. B., 455.
 Heyn, A. N. J., 448.
 Hibbard, A. D., 189.
 Hibbard, P. L., 158.
 Hibbard, R. P., 583.
 Hibbert, H., 25.
 Hickman, C. J., 778.
 Hickman, C. W., 372.
 Hickman, K. C. D., 701.
 Hicks, T. J., 811.
 Hicks, W. T., 197.
 Hinton, T. E., 212, 219, 227, 254, 255, 286.
 Higgins, E. R., 603.
 Hignett, S. L., 399.
 Hilbert, K. F., 668.
 Hilborn, M. T., 628, 629.
 Hildebrand, E. M., 66, 628, 630, 761.
 Hilditch, T. P., 379, 660.
 Hilleman, J. L., 664.
 Hilgeman, R. H., 193, 623.
 Hilgendorff, G., 58.
 Hill, A. B., 456.
 Hill, E. B., 833.
 Hill, F. F., 255.
 Hill, G. B., 325.
 Hill, G. W., 682.
 Hill, H., 209, 449.
 Hill, H. O., 823.
 Hill, J. A., 144, 580.
 Hill, I. W., 843.
 Hill, M., 608.
 Hill, R., 165.
 Hill, R. L., 123.
 Hill, R. T., 30.
 Hill, S. E., 166.
 Hill, S. O., 218.
 Hiller, E. T., 544.
 Hillermark, K., 676.
 Hillier, J. C., 795.
 Hillig, F., 728.
 Hills, J. L., 287.
 Hilton, G., 814.
 Hilton, J. H., 228, 234, 235.
 Hind, H. G., 281.
 Hindmarsh, W. L., 671.
 Hinds, R. E., 432.
 Miner, L. D., 757.
 Hinman, F. G., 653.
 Hinman, R. B., 795.
 Hinman, W. S., Jr., 152.
 Hinshaw, H. C., 525.
 Hinshaw, W. R., 535.
 Hirschhorn, E., 632, 772.
 Hirschhorn, J., 632.
 Hitchcock, A. E., 17.
 Hitchcock, C. L., 592.
 Hixon, R. M., 678, 759.
 Hixson, E., 786.
 Hoagland, D. R., 291, 307.
 Hoare, C. A., 819.
 Hobbs, C. S., 795.
 Hobgood, C. G., 320.
 Hobson, A., 652.
 Hochman, A., 176.
 Hocking, W. E., 687.
 Hockley, H. A., 406.
 Hodge, H. M., 520, 806.
 Hodgen, W. R., 178.
 Hodgson, R. E., 383, 862.
 Hodgson, R. W., 476.
 Hodson, A. Z., 422, 820.
 Hoerner, G. R., 775.
 Hoerner, J. L., 642.
 Hofer, A. W., 481, 616.
 Hoffman, A. C., 542, 687.
 Hoffman, C., 161, 293.
 Hoffman, E. J., 728.
 Hoffman, I. C., 473.
 Hoffman, M. B., 59, 761.
 Hoffman, W. A., 357.
 Hoffmann, C. H., 78, 357, 370.
 Hoffsommer, H., 119, 266.
 Hogan, A. G., 376, 382, 417, 506, 510, 518, 851.
 Hogan, T. W., 654.
 Hoge, W. G., 298.
 Holdaway, C. W., 235.
 Holden, C. B., 582.
 Holdsworth, R. P., 478.
 Holland, E. B., 551.
 Holland, R. F., 664, 805, 809.
 Hollander, F., 318.
 Hollender, H., 664.
 Holley, W. C., 834.
 Hollingsworth, H. S., 494.
 Holloway, J. K., 88.
 Holloway, T. E., 368, 494.
 Hollowell, E. A., 177, 470.
 Holm, G. C., 372, 389, 398.
 Holman, H. J., 215.
 Holmes, A. D., 236, 512, 513, 846.
 Holmes, C. E., 512.
 Holmes, F. O., 628.
 Holsoe, T., 736.
 Holst, E. C., 354, 793.
 Holt, B. A., 687.

- Holton, C. S., 199, 633.
 Holtz, P., 710.
 Honeywell, E. R., 185, 196
 Hood, C. E., 651.
 Hood, J. D., 217.
 Hooker, C. W., 677.
 Hoos, S., 543.
 Hooton, D. R., 181.
 Hoover, C. D., 15, 319, 755
 Hoover, S. R., 21, 168.
 Hope, A., 470.
 Hopkins, J. A., 404, 829.
 Hopkins, J. W., 11, 380, 451.
 Hopkins, W. S., 545.
 Hopper, T. H., 307.
 Hopperstead, S. L., 628.
 Horányi, M., 704.
 Horlacher, W. R., 655, 718.
 Horn, C. A., 462.
 Horn, C. L., 337, 764.
 Horner, W. W., 442.
 Horrall, B. E., 235.
 Horsfall, F. L., Jr., 243, 344, 524.
 Horsfall, J. G., 342, 628.
 Horton, C. R., 737.
 Horton, M. F., 3.
 Hosbrook, L. F., 653.
 Hoskins, W. M., 74, 496, 650, 792.
 Hosmer, R. S., 478.
 Hosny, M., 647.
 Hosterman, W. H., 35.
 Hostetler, E. H., 659.
 Hotchkiss, H. S., 154.
 Hotchkiss, N., 213.
 Hotson, H. H., 741.
 Hough, L. F., 620.
 Hough, W. S., 74, 789.
 Houser, J. S., 225, 789.
 Houston, J., 519, 583.
 Hovden, A., 155.
 Hove, E., 693.
 Hoveland, N., 718.
 Hovig, M., 715.
 Howard, A., 606.
 Howard, A. W., 664.
 Howard, F. L., 208, 481, 628.
 Howard, H. W., 453.
 Howard, R. S., Jr., 220.
 Howe, O. W., 829.
 Howe, P. E., 291, 795.
 Howe, R., 361.
 Howell, C. E., 531, 675.
 Howell, D. E., 525, 786.
 Howell, H., 789.
 Howlett, F. S., 332, 619.
 Hsiang, C. Y., 115.
 Hsu, H. C., 711.
 Hu, C. K., 317.
 Hubbell, R. B., 228.
 Huber, G. A., 58, 342, 642.
 Huber, L. L., 82, 361.
 Huckabee, J. W., Jr., 13.
 Hucker, G. J., 152, 521.
 Hockett, H. C., 365.
 Huddleson, I. F., 245, 246, 388, 669.
 Hudelson, R. R., 829.
 Hudson, C. B., 532, 822.
 Hudson, G. D., 829.
 Huebner, C., 669.
 Huegy, H. W., 262.
 Huelsen, W. A., 45, 358.
 Huff, C. G., 534.
 Huff, J., 430.
 Huffman, C. F., 90, 383.
 Hufnagel, C. F., 811.
 Hughes, E. C., 695.
 Hughes, E. H., 231, 377, 388, 819.
 Hughes, J. S., 419.
 Hughes, K. W., 304.
 Hull, A. C., Jr., 613.
 Hultz, F. S., 230.
 Hume, A. N., 179, 752.
 Hume, E. E., 295.
 Hume, E. P., 765.
 Hume, H. H., 144.
 Humes, A. G., 668.
 Hummel, F. C., 550, 551, 844.
 Humphrey, E. N., 399.
 Humphrey, G. D., 144.
 Humphreys, F. A., 815
 Hungate, R. E., 780.
 Hungerford, C. W., 144, 430
 Hungerford, H. B., 75.
 Hunt, C. H., 227, 799.
 Hunscher, H. A., 844.
 Hunt, E. P., 272.
 Hunt, R. E., 226
 Hunter, A. C., 729.
 Hunter, E. D., 401.
 Hunter, G. J. E., 520.
 Hunter, J. H., 177, 301.
 Hurlburt, V., 115.
 Hurt, B. H., 687.
 Hurwitz, A., 569.
 Hussemann, D., 693.
 Hutcheson, J. R., 144.
 Hutcheson, T. B., 178, 754.
 Hutchins, L. M., 629.
 Hutchins, R. E., 79.
 Hutchinson, A. H., 447.
 Hutchinson, J. C. D., 232.
 Hutchison, C. B., 5, 144, 577.
 Huthnance, S. L., 517.
 Hutson, J. B., 687.
 Hutson, L. R., 246.
 Hutson, R., 215, 358.
 Hutt, F. B., 251, 747.
 Hutton, R. S., 582.
 Huxley, J., 74.
 Huyke, R., 831.
 Hyland, F., 454.
 Hyre, F. M., 542.
 Hyslop, J. A., 493.
 Igriskaja, E. V., 599.
 Imle, E. P., 487.
 Imms, A. D., 85.
 Ingham, G., 297.
 Ingram, J. W., 358, 495.
 Inman, O. L., 165.
 Innes, J. R. M., 247.
 Insko, W. M., Jr., 226, 510, 511, 504.
 Iob, V., 552.
 Ireland, E. J., 310.
 Ireland, J. C., 752.
 Ireland, J. T., 696.
 Irish, C. F., 629.
 Irvin, C. J., 464.
 Irving, J. T., 127.
 Irwin, J. O., 584.
 Irwin, M. R., 314, 527.
 Irwin, W. E., 511.
 Isaac, L. A., 197.
 Isaacs, R., 73.
 Isaacs, B., 715.
 Isbell, H., 564.
 Isler, D. A., 679.
 Israelsen, O. W., 108.
 Itoh, M., 463.
 Ittner, N. R., 231.
 Ivanoff, S. S., 757, 770.
 Iveison, V. E., 630.
 Ivey, G., 711.
 Ivy, A. C., 715, 750.
 Iyer, S. G., 253.
 Jaap, R. G., 510, 607, 747, 802.
 Jackman, E. R., 324.
 Jackson, H. C., 664, 665.
 Jackson, H. W., 781.
 Jackson, L. E., 144, 432.
 Jackson, L. W. R., 478.
 Jackson, R. F., 729.
 Jackson, R. W., 125.
 Jacob, A. W., 401.
 Jacob, M., 230, 381.
 Jacob, W. C., 39.
 Jacob, W. J., 759.
 Jacobs, L., 214.
 Jacobs, W. C., 153.
 Jacobsen, D. H., 806.
 Jacobsohn, D., 461.
 Jacobson, H. G. M., 443.
 Jacques, A. G., 166.
 James, G. M., 451.
 James, G. V., 696.
 James, L. E., 796.
 James, W. O., 451.
 Jameson, D. H., 22.
 Jameson, G. S., 729.
 Jamison, C. H., 90.
 Jancke, O., 788.
 Jane, F. W., 310.
 Janes, M. J., 787.
 Janoschek, A., 240.
 Jarnagin, M. P., 226.
 Jebe, E. H., 184.
 Jeffers, L. M., 729.
 Jeffers, W. F., 61.
 Jefferson, C. H., 430.
 Jeffrey, F. P., 510, 661.
 Jeffrey, R. N., 233.
 Jeffries, C. D., 442.
 Jehle, R. A., 348.

- Jamison, G. M., 197.
 Jenkins, A. E., 199, 201, 628, 771, 772.
 Jenkins, H., 810.
 Jenkins, L., 839.
 Jenkins, P. M., 611.
 Jenkins, R. R., 143, 566, 838.
 Jenkins, T. N., 492.
 Jenkins, W. H., 177.
 Jennings, B. A., 826.
 Jennings, D. S., 587.
 Jensen, B. M., 685.
 Jensen, H., 30, 318.
 Jensen, H. A., 594.
 Jensen, H. B., 279.
 Jensen, J. H., 326.
 Jensen, S. O., 239.
 Jensen, V. S., 56, 199.
 Jepson, H. G., 108.
 Jerstad, A. C., 675.
 Jessen, R. J., 681.
 Jesus, Z. de, 533, 655, 673.
 Jewett, H. H., 357.
 Jewett, S. G., 492.
 Jewett, T. N., 299.
 Jinkins, R., 729.
 Jodon, N. E., 605.
 Joffe, J. S., 155, 156.
 Johann, H., 845.
 Johansen, D. A., 310.
 Johansen, S., 266.
 Johns, C. K., 240, 811.
 Johnson, B. C., 662, 664.
 Johnson, C. G., 645, 790.
 Johnson, D. L., 185, 366.
 Johnson, E., 641.
 Johnson, E. C., 147, 687.
 Johnson, E. F., 182.
 Johnson, E. L., 16.
 Johnson, E. M., 627, 768.
 Johnson, E. P., 359, 821.
 Johnson, F., 628.
 Johnson, F. F., 507.
 Johnson, F. H., 169.
 Johnson, G., 295, 414, 511.
 Johnson, G. M., 729.
 Johnson, H. N., 251, 388.
 Johnson, H. W., 627.
 Johnson, I. B., 795, 859.
 Johnson, I. J., 26, 27.
 Johnson, J., 199.
 Johnson, L. R., 639.
 Johnson, M., 755.
 Johnson, N. W., 408.
 Johnson, P., 795, 805.
 Johnson, P. C., 370.
 Johnson, P. E., 382.
 Johnson, P. E., 752, 806.
 Johnson, R. F., 319.
 Johnson, S. E., 406, 687.
 Johnson, S. R., 376.
 Johnson, T., 63, 345, 773.
 Johnson, T. D., 403.
 Johnson, W. M., 340.
 Johnston, C. O., 502, 630, 774.
 Johnston, I. M., 24.
 Johnston, S., 621.
 Johnstone, P. H., 686, 687.
 Johnstone-Wallace, D. B., 751.
 Jolivet, J. P., 629.
 Jolliffe, N., 708, 850, 862.
 Jones, D. F., 47.
 Jones, D. L., 752, 823.
 Jones, D. P., 792.
 Jones, E. P., 83.
 Jones, E. T., 502.
 Jones, F. R., 324, 633.
 Jones, H. A., 187.
 Jones, H. E., 299.
 Jones, J. H., 138, 752, 795.
 Jones, J. M., 795, 856.
 Jones, J. O., 777.
 Jones, J. S., 470.
 Jones, L. K., 199, 353, 779.
 Jones, L. W., 97.
 Jones, R. B., 226.
 Jones, S. C., 74.
 Jones, S. E., 787.
 Jones, T. C., 674.
 Jones, T. H., 860.
 Jones, T. N., 300.
 Jones, T. P., 670.
 Jones, W. N., 600.
 Jones, W. S., 439.
 Jones, W. W., 624.
 Joranson, P. N., 340.
 Jordan, B., 729.
 Jordan, H. V., 347, 611.
 Jordan, R., 269.
 Josephson, D. V., 517.
 Josephson, H. R., 238.
 Joslyn, M. A., 295, 582.
 Judkins, W. P., 331.
 Jukes, T. H., 506, 808, 848.
 Jull, M. A., 510, 511.
 Jungblut, C. W., 283.
 Jungherr, E., 389, 510, 527, 676.
 Junnila, W. A., 288.
 Justice, R. S., 740.
 Kadow, K. J., 205, 627, 628, 629.
 Kagy, J. F., 218, 644.
 Kaiser, S., 18, 596.
 Kakavas, J. C., 388.
 Kalmbach, E. R., 213, 356.
 Kamen, M. D., 603.
 Kamiya, N., 593, 599.
 Kamm, O., 714, 715.
 Kanipe, L. A., 469.
 Kapur, A. P., 223.
 Kardos, L. T., 302.
 Kark, K., 562.
 Karlson, A. G., 244, 530, 531, 674.
 Karlsson, N., 588.
 Karper, R. E., 752.
 Karraker, P. E., 13, 177.
 Karrer, P., 728.
 Karahan, M., 554, 555.
 Kase, J. C., 196, 860.
 Kass, J. P., 809.
 Katkoff, V., 256.
 Kato, K., 568, 569.
 Katz, M., 213, 449.
 Katz, S. I., 543.
 Katzin, B., 697.
 Katznelson, H., 21, 168, 739.
 Kaufman, H. F., 834.
 Kaufmann, O., 788.
 Kausche, G. A., 202.
 Kauzal, G. P., 248.
 Kaye, I. A., 438.
 Keating, F. E., 795.
 Keaton, C. M., 802.
 Keen, B. A., 12.
 Keifer, H. H., 655.
 Keil, J., 345.
 Keiles, E. O., 699.
 Keith, T. B., 507, 508.
 Keitt, G. W., 628.
 Kellar, V. M., 144.
 Kellermann, J. H., 842.
 Kelley, H. C., 630.
 Kelley, O. J., 157.
 Kelley, T. F., 794.
 Kellogg, C. E., 290, 587, 681, 828, 829.
 Kellogg, P. P., 781.
 Kellogg, W. H., 782.
 Kelly, E., 281.
 Kelly, E. G., 495.
 Kelly, F. J., 3.
 Kelly, J. W., 142.
 Kelson, R. A., 245, 397, 398.
 Kelsch, H. T., 825.
 Kelsheimer, E. G., 199.
 Kelso, M. M., 828, 829.
 Kemmerer, A. R., 582, 731.
 Kemp, M., 812.
 Kemp, W. B., 319.
 Kempster, E., 845.
 Kempster, H. L., 510.
 Kendall, J. C., 861.
 Kendrick, J. B., 628.
 KenKnight, G., 629.
 Kennard, D. C., 94, 804.
 Kensler, G. T., 105.
 Kent, G. C., 59, 843.
 Kent, G. C., Jr., 315.
 Kenworthy, A. L., 189.
 Kephart, L. W., 329.
 Kepner, R. A., 680.
 Keppel, D. M., 274.
 Keppel, J. J. G., 814.
 Kerby, G. P., 815.
 Keresztesy, J. C., 562.
 Kern, C. A., 575.
 Kern, F. D., 844.
 Kernkamp, H. C. H., 249, 388.
 Kernohan, G., 107.
 Kerr, R. H., 729.
 Kerr, T. W., Jr., 85, 786.
 Kartess, Z. I., 309, 473.
 Keyes, C. G., 195, 211, 765.
 Keyes, D. M., 682.
 Keyes, S., 682.

- Khan, H., 788.
 Khanmai, M. A., 762.
 Kick, C. H., 799.
 Kidson, E. B., 777.
 Kienholz, J. R., 58, 486.
 Kies, M. W., 133.
 Kiesselsbach, T. A., 324.
 Kifer, R. S., 687.
 Kik, M. C., 550.
 Kildee, H. H., 5, 144.
 Killough, D. T., 325, 752, 770, 823.
 Kimball, G., 795.
 Kimball, K. E., 198.
 Kimbrough, W. D., 41.
 Kime, P. H., 489.
 Kimmel, R. I., 687.
 Kincaid, R. R., 489.
 Kincer, J. B., 153, 296.
 King, A., 180.
 King, A. J., 184.
 King, C. G., 135.
 King, C. J., 489.
 King, C. W., 295.
 King, D. F., 89, 226.
 King, F. G., 226.
 King, H. D., 315, 606.
 King, J. F., 143.
 King, J. L., 785.
 King, L. S., 105.
 King, M. E., 585, 635.
 King, W. A., 662, 669.
 King, W. H., 729.
 King Wilson, W., 509.
 Kingsolver, C. H., 346.
 Kiplinger, D. C., 765.
 Kirby, R. S., 628, 629.
 Kirk, J. M., 12.
 Kirkland, B. P., 687.
 Kirkpatrick, C. M., 860.
 Kirkpatrick, W. F., 576.
 Kirschbaum, A., 677.
 Kirsner, J. B., 275.
 Kissner, J., 602.
 Kitchen, C. W., 685, 687.
 Kitselman, C. H., 674.
 Kittredge, J., 339.
 Klaas, H., 415.
 Klages, K. H., 319.
 Kleckner, A. L., 388.
 Kleiber, M., 782.
 Klein, H. Z., 217.
 Klein, L. A., 388.
 Kleinsmith, A. W., 150.
 Klemme, R. T., 256, 402.
 Klempner, E., 318.
 Kletchenko, A. V., 606.
 Kletzien, S. W., 553.
 Kline, E. M., 848.
 Kline, O. L., 729.
 Klose, A. A., 94, 294, 506.
 Klotz, L. J., 66, 636.
 Knapp, B., Jr., 798.
 Knaysi, G., 170, 805.
 Knechtges, J. W., 664.
 Kneeland, H., 574.
 Knight, C. A., 507.
 Knight, H. G., 34, 325.
 Knight, R. E., 319.
 Knipling, E. F., 83, 494, 650.
 Knott, J. C., 383.
 Knott, J. E., 759.
 Knowles, D., 42.
 Knowles, P. F., 43.
 Knowles, R. H., 397.
 Knowlton, G. F., 86, 221, 363, 501, 503, 651, 787, 792.
 Knowlton, K. R., 17.
 Knox, C. W., 173, 314.
 Knudson, L., 765.
 Koblitsky, L., 493.
 Kochhar, B. D., 710.
 Kock, G. de, 814.
 Koehn, C. J., 801.
 Koehnke, M., 326.
 Kohler, E., 775.
 Kohman, E. F., 277, 596.
 Koidsumi, K., 651.
 Kolb, J. H., 411, 682.
 Kolmer, J. A., 243.
 Komp, W. H. W., 220.
 Kon, S. K., 508, 518, 519, 583.
 Koones, H. F., 562.
 Kopland, D. V., 662, 807.
 Kossin, I. L., 457, 483.
 Kostoff, D., 744.
 Kramer, A., 838.
 Kramer, B., 699.
 Kramer, M., 637.
 Kramer, M. M., 664.
 Kramer, P. J., 744.
 Kraus, E. J., 452, 467.
 Kraus, J. E., 331.
 Krauss, W., 570.
 Krauss, W. E., 810.
 Kraybill, H. R., 150, 227, 228, 291, 304, 448.
 Kretting, L. W., 782.
 Kretlow, K. W., 16.
 Kretschmar, H. H., 240.
 Kreutzer, W. A., 64, 343, 347, 774.
 Krewson, C. F., 840.
 Krienke, W. A., 806.
 Kringstad, H., 282.
 Krishnan, P. S., 273.
 Krishnaswamy, T. K., 273.
 Kriss, M., 507.
 Kroeber, J. K., 488.
 Krogh, A., 296.
 Kroulik, J. T., 169, 204.
 Krug, H. P., 23.
 Krukovsky, V. N., 666, 805.
 Krull, W. H., 394, 526.
 Kruse, H. D., 707, 842.
 Krusekopf, H. H., 828.
 Ku, H. C., 271.
 Kucinski, K. J., 551.
 Kuenzel, J. G., 340.
 Kuhlman, A. H., 98, 795, 806.
 Kuhn, A. O., 319.
 Kuhn, L. W., 783.
 Kuhn, R., 285.
 Kuhn, T. M., 495.
 Kuilman, L. W., 632.
 Kuitunen-Ekbaum, E., 103.
 Kulash, W. M., 70.
 Kulp, M. R., 298, 399, 825.
 Kumlien, W. F., 834.
 Kumm, H. W., 220.
 Kummer, F. A., 109.
 Kummerow, F., 603.
 Kunerth, B. L., 564.
 Kunkel, L. O., 628.
 Kunsman, C. H., 780.
 Kuntz, W. A., 486.
 Kunz, H., 279.
 Kupperman, H. S., 317.
 Kurland, A. A., 175, 401.
 Kuschke, B. M., 857.
 Kuykendall, R., 34, 319, 320, 755.
 Kuzmeski, J. W., 740.
 Kyle, E. J., 325.
 Kyrk, H., 856.
 Lacy, M. G., 143.
 Ladd, C. E., 144, 859.
 Ladd, C. S., 729.
 Ladejinsky, W., 256.
 LaDue, J. P., 218.
 Laflue, D. W., 212.
 Laing, H. E., 16.
 Lakin, H. W., 14.
 Lakon, G., 788.
 Lamanna, C., 169, 800.
 Lamar, J. K., 610.
 Lambert, W. V., 172, 316, 381, 798.
 Lamerson, P. G., 75, 501.
 Lamoreux, W. F., 514, 608, 747, 804.
 LaMotte, M., 765.
 Lampman, C. E., 372.
 Lan, T. H., 712.
 Landauer, W., 510.
 Lan'erman, H. L., 258.
 Landis, P. H., 668.
 Landon, R. H., 53.
 Landsberg, H., 585.
 Landsberg, J. W., 398, 710.
 Lanford, C. S., 275, 841.
 Lang, K. L., 453.
 Lange, E. H., 228.
 Lange, W. H., Jr., 506.
 Langenheim, K., 110.
 Langford, G. S., 74.
 Langham, R. F., 388, 675.
 Langham, W., 90.
 Langley, B. C., 154, 290, 752, 823.
 Langlykke, A. F., 507.
 Lansing, A. I., 96.
 Lapage, G., 390.
 Lapham, E. G., 152.
 Lardy, H. A., 173.
 Larmour, B. K., 184.
 Larsen, C., 829.
 Larsen, J. A., 625.
 Larsen, L. F., 823.
 Larson, A. L., 681.

- Larson, N. G., 257, 334.
 Larson, N. P., 786.
 Larson, R. A., 243.
 Larson, R. H., 628.
 La Rue, C. D., 16, 17.
 Lash, E., 104.
 Latham, D. H., 478.
 Latimer, L. P., 474.
 Lauderdale, J. L. E., 80.
 Lauffer, M. A., 208.
 Laur, E., 110.
 Laurence, G. B., 799.
 Laurie, A., 194, 705.
 Lauritzen, C. W., 588.
 Lauritzen, J. I., 437, 468.
 Lavis, C. A., 41.
 Lawless, W. W., 336.
 Lawrence, D. B., 18.
 Lawrence, W. E., 159.
 Lawrence, W. W., 486.
 Lay, D. W., 355.
 Lea, C. H., 370.
 Leach, C. N., 251, 388.
 Leach, J. G., 57, 472, 496, 627, 771.
 Leach, L. D., 58.
 Leahy, H. W., 808.
 Leahy, J. F., 6.
 Lear, G., 486.
 Leatham, J. H., 450, 460.
 Leatherman, M., 472.
 Leathers, W. S., 835.
 Lebaron, R. K., 626.
 LeBeau, F. J., 350.
 Lebedeff, G. A., 171.
 LeBlanc, F. J., 813.
 LeClerg, E. L., 326, 634.
 Lederer, E., 285.
 Lee, A., 575, 718.
 Lee, C. D., 389.
 Lee, F. A., 152, 332, 334, 338.
 Lee, O. C., 254.
 Lefebvre, C. L., 627.
 Legault, A. R., 677.
 Leggatt, C. W., 470.
 Lehman, E., 559.
 Lehman, H. H., 861.
 Lehman, S. G., 348.
 Lehmann, P., 734.
 Lehmann, V. W., 781.
 Leichsenring, J. M., 415.
 Leigh, W. H., 641.
 Leighton, A., 243.
 Leissner, G. N., 321.
 Leitch, I., 659.
 Lenher, S., 325.
 Lennette, E. H., 243.
 Lennox, F. G., 248.
 León, J., 587.
 Leonard, E. B., 764.
 Leonard, L. T., 168.
 Leonard, S. L., 176.
 Leonard, W. H., 613.
 Leonian, L. H., 304, 596, 742.
 LePage, G. A., 702.
 Lepard, O. L., 384.
 Lerner, I. M., 33, 510, 532.
 Lesley, J. W., 65.
 Lett, E. R., Jr., 650.
 Leukel, R. W., 774.
 Levan, A., 20.
 Le Van, J. H., 85, 642.
 Leveck, H. H., 226, 374.
 Levenstein, I., 175.
 Levine, A. S., 170.
 Levine, J. M., 532.
 Levine, M., 16, 628.
 Levine, M. D., 713.
 Levine, N. D., 107, 249, 391, 392, 530, 822.
 Levine, P. P., 393, 532.
 Leviton, A., 240.
 Levitt, J., 448.
 Levy, E. B., 329.
 Lewis, A. A., 611.
 Lewis, A. B., 829.
 Lewis, D., 456.
 Lewis, F. H., 623, 709.
 Lewis, H., 593.
 Lewis, K. H., 169.
 Lewis, M. R., 678.
 Lewis, M. T., 471.
 Lewis, R. D., 177, 301, 324.
 Li, C. H., 316, 458.
 Li, H. W., 27.
 Li, Y., 625.
 Lieberman, F. V., 785.
 Liebig, G. F., Jr., 54, 352.
 Lightie, P. C., 628.
 Ligon, L. L., 752.
 Ligon, W. S., 13.
 Likert, R., 687.
 Lill, J. G., 7, 183, 320.
 Lilleland, O., 475.
 Lillie, R. D., 102.
 Lilly, V. G., 20, 22, 304, 596, 742.
 Lima, A. B., 65, 207, 635.
 Lincoln, C. G., 86, 371, 786.
 Lincoln, F. C., 213.
 Lind, H. E., 809.
 Linderström-Lang, K., 453.
 Lindgren, D. L., 647, 791.
 Lindquist, A. W., 224.
 Lindquist, J. C., 481, 632.
 Linford, M. B., 489.
 Ling, L., 347.
 Link, C. B., 471.
 Link, G. K. K., 16, 17, 18, 628.
 Link, K. P., 669, 814.
 Linn, M. B., 353.
 Linser, H., 743.
 Linsley, E. G., 503.
 Lipman, J. G., 156.
 Lipska, I., 240.
 Lipson, M., 672, 817.
 Little, M. L., 329.
 Little, K. S., 493.
 Little, L., 583.
 Little, E. B., 247, 527.
 Little, V. A., 787.
 Liu, S. H., 711.
 Live, I., 104.
 Lively, C. E., 834.
 Livermore, J. R., 751.
 Livey, E. A., 510, 659, 748, 796.
 Livingston, B. E., 16, 25, 291.
 Livingston, R., 309.
 Livingstone, E. M., 494.
 Lloyd, D., 154.
 Lloyd, D. C., 225.
 Lloyd, J. W., 183.
 Lloyd, O. G., 256.
 Lochhead, A. G., 202, 302.
 Locke, S. B., 630.
 Loconti, J. D., 473.
 Loehwing, W. F., 449.
 Loesbecke, H. W. von, 732.
 Logaras, G., 123.
 Lohr, W. H., 582.
 Long, C. N. H., 697.
 Long, D. D., 765.
 Long, J. D., 440.
 Long, J. H., 622.
 Long, W. H., 211.
 Longenecker, T. C., 740.
 Longley, E. O., 673.
 Longrée, K., 350, 353, 769.
 Longwell, J. H., 720.
 Lönnemark, H., 738.
 Loo, S. W., 162.
 Loomis, C. P., 688.
 Loomis, N. H., 764.
 Loosli, J. K., 660, 781, 805.
 Lord, J. W., Jr., 715.
 Lorenz, F. W., 32, 33, 748.
 Lorenz, O. A., 204, 759.
 Lorenz, R. C., 637.
 Loring, H. S., 207.
 Lory, C. A., 5, 144.
 Lotze, J. C., 602.
 Loughary, I. H., 383.
 Loustalot, A. J., 474.
 Louw, J. G., 372, 873.
 Love, H. H., 751.
 Love, R. M., 62, 745.
 Love, W. G., 388.
 Lovvorn, R. L., 41.
 Lowe, A. M., 485.
 Lowe, B., 413.
 Lowman, M. S., 244.
 Lozner, E. L., 562.
 Lu, G. D., 133, 134, 135, 228.
 Lu, L. K., 805.
 Lubatti, O. F., 79.
 Lubbock, D. M., 128.
 Lucas, A. M., 820.
 Lucia, S. P., 852.
 Luck, J. M., 74.
 Ludeman, B. E., 781.
 Ludwig, C. A., 168.
 Ludwig, D., 503.
 Luebke, B. H., 260, 264, 406, 408.
 Lugnbill, P., 212.
 Lumer, H., 606.
 Lumpkin, K. D., 690.
 Lumsden, D. V., 339.
 Lumsden, W. H. R., 534.

- Lundblad, K., 321.
 Lunde, G., 232.
 Lundegårdh, H., 595.
 Lundy, G., 828.
 Lute, A. M., 324.
 Lutman, A. S., 616.
 Luttermoser, G. W., 223, 251.
 Luttrell, E. S., 68, 354.
 Lutz, H., 211.
 Lutz, H. J., 339.
 Lutz, J. F., 736.
 Luyet, B. J., 16.
 Lyford, W. H., Jr., 587.
 Lyle, C., 361, 366, 494.
 Lyle, E. W., 770.
 Lyman, J. F., 755.
 Lynch, D. F. J., 325.
 Lynch, S. J., 335, 476, 624.
 Lyon, B. M., 243.
 Lyon, C. J., 163, 296.
 Lyons, W. R., 317.
 Lythgoe, B., 281.
 Lythgoe, H. C., 664.

 Maack, A. C., 519, 523.
 Mabry, J. E., 785.
 McAlister, E. D., 25.
 MacAloney, H. J., 493.
 McAtee, W. L., 213.
 McBee, J. A., 381.
 McBeth, C. W., 489.
 McBride, C. G., 265, 410, 510.
 McCain, R., 491, 495.
 McCall, G. L., 213, 644.
 McCalla, T. M., 169, 455, 589.
 McCallan, S. E. A., 202, 628, 629.
 McCampbell, C. W., 373.
 McCance, R. A., 123, 127.
 McCartney, W., 509.
 McCarty, F. C., 362.
 McCauley, W. E., 359.
 McCay, C. M., 403, 781, 795, 805.
 McCay, J. B., 548, 549.
 McClanahan, R. C., 212, 213.
 McClary, J. E., 304.
 McClaskey, B. R., 120.
 McClellan, W. D., 628, 769.
 McClelland, C. K., 38.
 McClelland, J. F., 18.
 McClerg, H. L., 178.
 McClintock, J. A., 185, 192.
 McClung, L. S., 171.
 McCollum, E. V., 126, 699, 706, 713.
 McCollum, J. P., 757.
 McConnell, H. S., 74.
 McCoord, A. B., 559, 702.
 McCord, J. E., 537.
 McCormick, E. M., 220.
 McCown, M., 559.
 McCoy, E., 582.
 McCoy, E. E., 655.
 MacCreary, D., 71, 868.
 McCrory, S. A., 77, 757.
 McCubbin, E. N., 182, 751.

 McCue, C. A., 191.
 McCullagh, D. R., 610.
 McCulloch, E. C., 101, 388, 670.
 McCulloch, L., 476.
 McCullough, H. E., 140.
 MacCurdy, R. D., 236.
 McDaniel, A., 320.
 McDaniel, E. I., 210.
 MacDaniels, L. H., 761.
 MacDonald, D. G. H., 703.
 McDonald, R., 557.
 McDonald, V. R., 93.
 McDonald, W. F., 442.
 McDonnell, A. D., 342.
 McDougale, H. C., 253.
 McDowall, F. H., 811.
 McDowell, C. H., 770.
 MacDowell, E. C., 314.
 McDuffie, W. C., 785.
 McElwee, E. W., 44.
 McEntee, J. J., 70.
 McEwen, A. D., 246, 306.
 McFadden, E. S., 752, 768, 770.
 McFarlane, J. S., 500.
 MacFarlane, W. D., 510.
 McGarr, R. L., 494.
 McGahey, P. H., 11.
 McGeorge, W. T., 45, 55, 187, 582.
 MacGillivray, J. H., 44.
 McGoldrick, F., 17.
 McGregor, S. E., 505.
 McGregor, W. S., 787.
 McIlattin, T. H., 779.
 McHenry, E. W., 703, 709.
 McIlhenny, E. A., 458.
 MacIlraith, J. J., 608.
 McIlvaine, H. R. C., 17.
 McIlvaine, T. C., 736, 754.
 McIntire, F. C., 772.
 MacIntire, W. H., 178, 303, 522, 729.
 McIntosh, A., 214.
 McIntosh, J., 566.
 McIntosh, R. A., 388.
 MacIntyre, T. M., 510.
 Mack, P. B., 419, 547.
 Mack, W. B., 46, 166, 471.
 McKaig, N., Jr., 177, 590.
 McKay, A. W., 832.
 McKee, C., 718.
 McKee, R., 324, 754.
 McKee, R. K., 67, 481.
 McKelvey, J. J., Jr., 627, 628, 790, 791.
 Mackenzie, C. G., 713.
 McKenzie, D. A., 399.
 McKenzie, F. F., 314, 316.
 McKenzie, F. P., 610.
 Mackey, A. C., 795.
 Mackey, A. K., 836.
 McKay, B., 845.
 McKibbin, J. M., 563, 693.
 McKimmon, W. S., 846.
 McKinley, W. A., 233.

 Mackinney, G., 19.
 Mackinnon, J. E., 160.
 Mackintosh, J., 517.
 McLaughlin, F. A., 460.
 McLean, A. C., 338.
 McLean, F. T., 332, 338.
 McLean, L. G., 757.
 McLean, R. S., 310.
 MacLelsh, K., 544.
 MacLeod, A., 400.
 MacLeod, F. L., 506, 657.
 MacLeod, G. F., 792.
 McMahan, P. R., 23.
 McMath, C. W., 325.
 McMeekan, C. P., 231, 377.
 McMillan, A. M., 233.
 McMillen, W. N., 90.
 McMillion, T. M., 13.
 McMunn, R. L., 620.
 McNall, P. E., 255, 682.
 McNally, E. H., 510.
 McNamara, H. C., 181.
 McNamara, R. L., 602.
 McNeely, J. G., 113, 401.
 McNew, G. L., 483, 484.
 McNutt, S. H., 528.
 Macormac, A. R., 324.
 McPherson, W. K., 678.
 McQuilkin, W. E., 340, 625.
 Macrae, T. F., 281, 583.
 McRary, W. L., 450.
 MacRill, J. R., 387.
 McVaugh, R., 446.
 McVeigh, I., 164.
 McVicker, M. H., 446.
 McWhorter, F. P., 58, 211.
 McWhorter, O. T., 486.
 Macy, I. G., 548, 550, 551, 844.
 Macy, P. F., 735.
 Madamba, A. L., 17.
 Madden, F., 574.
 Madsen, D. E., 818.
 Madsen, L. L., 800.
 Madsen, M. A., 374, 536, 657.
 Madson, R. A., 324.
 Magee, A. C., 828.
 Magie, R. O., 634.
 Magness, J. R., 474, 619, 761, 764.
 Magnusson, H., 677.
 Magoon, C. A., 475, 763, 764.
 Magruder, J. W., 319.
 Maguire, B., 43.
 Maheshwari, P., 744.
 Mahoney, C. E., 204, 838.
 Mahoney, J. J., 611.
 Mahoney, J. L., 240.
 Mail, G. A., 642.
 Maitra, M. K., 280.
 Malan, A. I., 372, 373, 799.
 Malandkar, M. A., 416.
 Malik, A. Q., 710.
 Mallik, A. K., 11.
 Mallmann, W. L., 97, 245, 584, 661.
 Malone, C. C., 404, 829.

- Malphrus, L. D., 406.
 Manalo, P. S., 518.
 Mandenberg, E. C., 488.
 Maneval, W. E., 480.
 Maney, T. J., 48, 338.
 Mangelndorf, P. C., 752, 770.
 Manhart, V. C., 235.
 Mani, M. S., 225, 789.
 Manis, H. C., 789.
 Manning, P. D. V., 513.
 Manning, W. M., 18.
 Manns, T. F., 628.
 Manresa, M., 229.
 Manske, R. H. F., 329.
 Manson, P. W., 536.
 Manthel, C. A., 388.
 Marais, J. S. C., 798, 799.
 Marble, D. R., 507, 532, 802.
 Marchant, A. D., 771.
 Marchionatto, J. B., 206, 481.
 Marchioni, A. H., 645.
 Marcovitch, S., 792.
 Marcy, L. E., 507, 782.
 Margolf, P. H., 463, 507, 510.
 Margolin, A. S., 741.
 Maris, P. V., 687.
 Markley, K. S., 325.
 Markwood, L. N., 860, 361.
 Marlatt, A. L., 755.
 Marlow, H. W., 462.
 Marlowe, R. H., 493.
 Marquardt, J. C., 235, 241, 242, 294.
 Marques de Almeida, C. R., 764.
 Marr, J. C., 399, 825.
 Marsh, F. L., 600.
 Marsh, G. H., 143.
 Marsh, H., 668.
 Marsh, P. M., 628.
 Marsh, R. E., 687.
 Marsh, R. S., 758.
 Marsh, R. W., 585.
 Marshall, F. H. A., 315.
 Marshall, G. E., 212, 254, 359, 792.
 Marshall, J., 649.
 Marshall, R. P., 68, 637.
 Marten, E. A., 627, 766.
 Marth, P. C., 50.
 Martin, A. L., 752, 770.
 Martin, A. R., 181, 451.
 Martin, C. H., 642.
 Martin, C. B. A., 270.
 Martin, D. S., 717.
 Martin, E. V., 163.
 Martin, G. W., 23.
 Martin, H., 341, 496.
 Martin, Jos. H., 511, 804.
 Martin, J. P., 156.
 Martin, R. G., 94.
 Martin, W. E., 623.
 Martin, William H., 859.
 Martin, Willard H., 580, 667, 810.
 Martin, W. J., 350.
 Martin, W. F., 582.
 Martland, J. G., 781.
 Marx, W., 531.
 Mason, E. W., 593.
 Mason, J. H., 523.
 Mason, T. G., 449, 450.
 Massey, L. M., 482, 769.
 Masters, M., 8, 127.
 Mather, K., 28.
 Mathers, W. G., 505, 642.
 Mathes, R., 368, 494.
 Mathews, F. P., 819.
 Mathews, J. A., 728.
 Mathias, M. E., 593.
 Mato, F. R., 160.
 Matsukawa, D., 151.
 Matthews, E. M., 469.
 Mattick, E. C. V., 808.
 Mattill, H. A., 506.
 Mattson, S., 155, 588, 738.
 Matzen, E. H., 827.
 Mauney, R., 401.
 Mauss, E. A., 244, 245.
 Maw, W. A., 510.
 Maxon, M. A., 471.
 Maxwell, L. R., 773.
 May, C., 199, 342, 628.
 May, C. O., 682.
 May, F. H., 213.
 May, J. E., 213.
 Mayer, D. T., 610.
 Mayer, I. D., 254.
 Mayfield, H. L., 122, 423, 424.
 Mayhew, R. L., 394.
 Maynard, L. A., 227, 384, 660, 795, 805, 847.
 Mayton, E. L., 33.
 Mazkevich, P. P., 599.
 Meader, E. M., 52.
 Meahl, R. P., 471.
 Means, R. H., 372, 401.
 Medler, J. T., 649.
 Megee, C. R., 183, 616.
 Mehl, J. M., 686.
 Mehl, P., 255.
 Meiklejohn, A. P., 562, 843.
 Melhus, I. E., 59.
 Metnke, W. W., 836.
 Melampy, R. M., 505.
 Melcher, L. R., 526.
 Melchers, L. E., 485.
 Melin, E., 743.
 Mello, I. F. de, 228.
 Mello, R. F., 172.
 Melville, E. M., 295.
 Melvin, B. L., 834.
 Melvin, E. H., 730.
 Melvin, R., 650.
 Mendoza, I. L., 676.
 Menefee, B. R., 254, 256.
 Menefee, S. G., 582.
 Meng, J. C., 27.
 Menusan, H., 787.
 Mercer, R. D., 324.
 Merchant, I. A., 813.
 Merckel, C., 817.
 Mercker, A. E., 34.
 Meredith, C. E., 481, 631.
 Merrillat, L. A., 671.
 Merrick F., 116, 403.
 Merrill, H., 73.
 Merrill, S., Jr., 211.
 Merrill, T. A., 190, 720.
 Merry, J., 16.
 Merwe, P. K. van der, 373.
 Merz, A. R., 592.
 Meservey, A. B., 552.
 Mesnard, J., 103.
 Metcalfe, G., 488.
 Metfessel, M., 318.
 Metzger, C. H., 64.
 Metzger, H. J., 388.
 Metzger, W. H., 301.
 Metzler, W. H., 401, 688.
 Meyer, C. E., 126.
 Meyer, F. G., 593.
 Meyer, H. A., 478.
 Meyer, K. F., 393.
 Meyer, R. K., 317, 318.
 Meyers, A. M., Jr., 829.
 Meyers, M., 114.
 Michael, C. E., 661.
 Michael, S. A., 442.
 Michelbacher, A. E., 653, 792.
 Michels, C. A., 319, 329.
 Mickel, C. E., 792.
 Mickelsen, O., 563.
 Mickle, W. A., 815.
 Middleton, G. K., 178, 616.
 Middleton, J. T., 199, 489, 769.
 Mighell, B. L., 255, 406.
 Milanex, F. R., 210.
 Milbrath, D. G., 480, 637.
 Milbrath, J. A., 58, 339, 342.
 Milby, T. T., 516, 747, 802.
 Miles, G. F., 17.
 Miles, H. A., 256.
 Miles, S. R., 178.
 Militzer, W. E., 189.
 Milk, R. G., 261.
 Milks, H. J., 668.
 Millar, C. E., 303, 739.
 Miller, A., 136.
 Miller, C. D., 412.
 Miller, D., 84, 96, 329.
 Miller, D. F., 88.
 Miller, E. C., 756, 774.
 Miller, E. E., 538.
 Miller, E. J., 533.
 Miller, E. V., 476.
 Miller, F. E., Jr., 654.
 Miller, F. W., Jr., 242.
 Miller, G. M., 237.
 Miller, H., 496.
 Miller, H. J., 475.
 Miller, H. W., 188.
 Miller, J. A., 212.
 Miller, J. C., 34, 178.
 Miller, J. H., 311, 769.
 Miller, J. I., 795.
 Miller, J. O., 199.
 Miller, J. W., 644.
 Miller, L. C., 729.
 Miller, L. I., 628.

- Miller, L. P., 16, 20.
 Miller, M. F., 144.
 Miller, P. E., 144.
 Miller, P. G., 385.
 Miller, P. R., 342, 629, 774.
 Miller, P. W., 58, 67, 342, 487.
 Miller, R. C., 507, 508.
 Miller, R. F., 91.
 Miller, R. L., 789.
 Miller, S. H., 852.
 Miller, W. R., 169.
 Miller, W. T., 395, 820.
 Milliron, H. E., 87, 501.
 Mills, H. B., 642, 785.
 Mills, H. S., 432.
 Mills, K., 795.
 Mills, R., 693, 845.
 Mills, R. C., 803.
 Mills, W. D., 628.
 Mills, W. R., 351, 432, 769.
 Milner, R. T., 182, 755.
 Milum, V. G., 371.
 Minarik, C. E., 752, 770.
 Minckler, L. S., 198, 766.
 Miner, E., 119.
 Miner, J. R., 793.
 Mingle, C. K., 388, 669.
 Minina, E. G., 599.
 Minneman, P. G., 256, 410.
 Mirov, N. T., 479.
 Mitchell, D. R., 682.
 Mitchell, H. H., 507.
 Mitchell, H. S., 417, 551.
 Mitchell, J. W., 452.
 Mitchell, M. P., 265.
 Mitchell, W. K., 476.
 Mitchener, A. V., 87.
 Mitra, A. K., 737.
 Mitra, R. P., 737.
 Mix, A. E., 728.
 Mixner, J. P., 611.
 Moe, L. H., 525, 786.
 Mohammad, A., 561.
 Mohler, J. R., 104, 671.
 Mohr, J. L., 454.
 Moir, G. M., 151, 670.
 Moldenke, H. N., 446.
 Molitor, H., 567.
 Molnár, S., 704.
 Moloneaux, P., 325.
 Moloney, J. P., 325.
 Mönning, H. O., 523, 814.
 Monroe, C. F., 755.
 Monroe, D., 429, 687, 717, 856.
 Monson, O. W., 254, 678.
 Montgomerie, R. F., 398.
 Montgomery, B. E., 212.
 Montgomery, J. F., 401.
 Moody, P. A., 732.
 Mook, P. V., 629.
 Moon, F. E., 89.
 Moore, A. W., 641.
 Moore, R., 317.
 Moore, E. N., 748, 807.
 Moore, H. R., 288, 827.
 Moore, J. D., 628.
 Moore, J. S., 98, 385, 403.
 Moore, L. B., 201.
 Moore, M. H., 585.
 Moore, M. T., 850.
 Moore, R. A., 862.
 Moore, R. C., 171.
 Moore, S., 82.
 Moore, T., 181, 250, 280, 281, 815.
 Moore, W. C., 200, 585.
 Moore, W. E., 16.
 Moore, W. J., 755.
 Moorman, R., 492.
 Moran, E. J., 366.
 Moran, T., 93.
 Morgan, A. F., 269, 419, 506, 801.
 Morgan, A. S., 144.
 Morgan, B., 121.
 Morgan, B. B., 783.
 Morgan, D. O., 397.
 Morgan, M. E., 242.
 Morgan, M. F., 443.
 Morgan, N. D., 41.
 Moriber, L., 161.
 Morison, F. L., 110, 260, 736.
 Morrell, E., 506, 657.
 Morrill, C. C., 391, 392.
 Morris, G. C., 470.
 Morris, H. E., 58, 627, 630.
 Morris, H. F., 735, 757.
 Morris, S., 373, 374.
 Morris, V. H., 793.
 Morrison, F. B., 795.
 Morrison, H. E., 88.
 Morrison, I. G., 109.
 Morrison, R. J. G., 671.
 Morrow, D., 592.
 Morrow, E. B., 58, 662.
 Morse, L., 839.
 Morse, W. J., 183, 755.
 Mortensen, E., 752, 757.
 Mortensen, M., 667.
 Mortenson, W. P., 115.
 Morton, M., 329.
 Moseley, M. A., 513.
 Moseley, M. A., Jr., 565.
 Moses, C. S., 357, 370.
 Moses, H. E., 530.
 Moss, A. E., 11, 199, 492.
 Moss, C. M., 100.
 Moss, W. A., 319.
 Mota, D. C., 88.
 Mota, J. R., 530.
 Moulton, F. R., 595.
 Moulton, J. E., 18, 628.
 Mounce, I., 354.
 Mouraviev, I., 160.
 Moutia, L. A., 369.
 Mowrey, B. G., 738.
 Moxon, A. L., 22, 499, 511, 524, 727, 802, 813, 837.
 Moyer, A. W., 274.
 Moyer, J., 568.
 Moynihan, I. W., 231.
 Mrak, E. M., 171, 440.
 Muckenhirn, R. J., 590.
 Mudge, C. S., 240.
 Muegge, O. J., 220.
 Mueller, W. S., 523, 531.
 Muggeridge, J., 652.
 Mulford, F. L., 476.
 Mull, L. E., 240.
 Muller, C. E., 454.
 Müller, F. P., 788.
 Mullie, G., 110.
 Mullin, J. R., 771.
 Mulvey, R. E., 178.
 Mumford, F. B., 5.
 Mundkur, B. B., 200.
 Munger, H. M., 769.
 Munger, M., 246.
 Munn, M. T., 460, 470, 624.
 Munns, E. N., 196.
 Muñoz, M., 658.
 Munro, H. K., 789.
 Munro, J. A., 358, 371, 499.
 Munro, J. W., 301.
 Munro, S. S., 457, 463, 511, 515.
 Munsell, H. E., 846.
 Munsey, V. E., 729.
 Murchison, C. T., 325.
 Murdock, F. M., 669.
 Murdock, W. D., 527.
 Murphey, C. E., 836.
 Murphy, D. F., 627.
 Murphy, D. M., 63, 342.
 Murphy, H. C., 846.
 Murphy, H. F., 752.
 Murphy, J. M., 393, 818.
 Murphy, L. M., 210.
 Murray, D. B., 385.
 Murray, H. C., 169.
 Murray, M. J., 605.
 Murray, W. D., 371.
 Murrill, W. A., 159.
 Mushbach, W. F., 411.
 Muse, M., 429.
 Musgrave, A. J., 362.
 Musgrave, G. W., 13.
 Musgrave, R. B., 751.
 Mussehl, F. E., 94.
 Musser, D. M., 325.
 Musser, H. B., 464.
 Mutch, J. R., 128, 181.
 Myers, A. T., 475, 763.
 Myers, C. E., 471.
 Myers, C. H., 324, 751, 769.
 Myers, H. E., 299.
 Myers, J. D., 598, 604, 743.
 Myers, J. A., 671.
 Myers, M., 795.
 Myers, R. M., 446.
 Myerson, P. G., 234.
 Nabours, R. K., 604.
 Naftel, J. A., 18.
 Nagayama, T., 439.
 Naghschi, J., 395, 481.
 Nagle, J. P., 341.
 Nakamura, F. I., 726.
 Nalbandov, A., 458.
 Nance, N. W., 12, 59.

- Narayan Rao M. A., 73.
 Narayanan, R. S., 641.
 Nash, K. B., 766.
 Nash, L. B., 451.
 Nath, R., 363.
 Natividade, J. V., 601.
 Naude, T. J., 700.
 Naumov, N. A., 160.
 Naylor, H. B., 90.
 Neal, D. C., 63, 342, 775.
 Neal, E. M., 765.
 Neal, M. C., 413.
 Neal, O. M., Jr., 159.
 Neal, P. A., 644.
 Neale, E. C., 286.
 Neale, P. E., 92.
 Neary, M. E., 222.
 Neave, S. A., 639.
 Nebel, B. E., 47, 597, 617.
 Needham, D. M., 135.
 Neel, L. R., 178, 230.
 Negri, T., 445.
 Negroni, P., 160, 445.
 Neill, J. C., 206.
 Neiswander, C. R., 358, 359, 793.
 Neitz, W. O., 523, 814.
 Neiva, C., 249.
 Nelson, A. L., 213.
 Nelson, A. Z., 539, 683.
 Nelson, C., 469.
 Nelson, C. I., 814.
 Nelson, D. H., 237.
 Nelson, F. E., 667, 810.
 Nelson, H. A., 347.
 Nelson, J. A., 662.
 Nelson, J. C., 687.
 Nelson, J. W., 416.
 Nelson, M., 40.
 Nelson, M. L., 198.
 Nelson, M. N., 389.
 Nelson, O. A., 774.
 Nelson, P., 401, 402, 834.
 Nelson, P. M., 413, 557.
 Nelson, R. C., 461.
 Nelson, U. C., 492.
 Nelson, V. E., 849.
 Nelson, W. L., 805.
 Nelson, W. O., 317.
 Nesbit, M. E., 669.
 Nestler, R. B., 213, 355.
 Netterstrom, R. W., 300.
 Nettles, V. F., 830.
 Nettles, W. C., 85, 494, 785.
 Neumann, H., 584.
 Neurath, H., 208.
 Neuweiler, W., 853.
 Nevens, W. B., 384.
 Newcomer, E. H., 18.
 Newcomer, E. J., 357.
 Newhall, A. G., 59, 628, 769.
 Newsom, I. E., 718.
 Newsom, L. D., 358.
 Newton, C., 243.
 Newton, M., 63, 345.
 Niblett, M., 361.
 Nicholas, J. E., 97, 536.
 Nicholls, W. D., 688.
 Nichols, A. A., 808.
 Nichols, J. E., 172.
 Nickerson, R. F., 325.
 Nickolaiczuk, N., 510.
 Nicol, H., 156.
 Nicol, J., 101.
 Nielsen, E. L., 576, 814.
 Nielsen, L. W., 482, 628.
 Nielson, A. B., 323.
 Nielson, E., 693.
 Nier, A. O., 170.
 Nietzke, G., 783.
 Nikitin, A. A., 628.
 Niklas, O. F., 783.
 Nilsson, F., 321.
 Nilsson-Leissner, G., 321.
 Nisbet, R. N., 382.
 Nispen tot Sevenaar, C. M. O. van, 256.
 Niven, C. F., Jr., 806.
 Nixon, E. L., 464.
 Nixon, M. W., 164.
 Nobles, M. K., 354.
 Noguera, J. R., 833.
 Nolan, A. F., 531.
 Noland, T. W., 97.
 Noll, C. F., 442, 464.
 Nolla, J. A. B., 149, 328.
 Nolte, A. J., 732.
 Nomland, R., 528.
 Nord, F. F., 23.
 Nordby, J. E., 313.
 Norman, A. G., 150, 455.
 Norris, D. O., 775.
 Norris, E. B., 144.
 Norris, E. L., 470.
 Norris, L. C., 94, 227, 388, 514, 602.
 Norris, R. T., 495.
 North, S. B., 28.
 Northern, H. T., 744.
 Norton, E. A., 829.
 Norton, L. B., 360, 583, 786.
 Norton, L. J., 111.
 Nottingham, J. O., 736.
 Nourse, E. G., 119.
 Novak, R., 267.
 Nowicki, S., 788.
 Nuetszman, D. D., 429.
 Nugent, T. J., 483.
 Numata, I., 151.
 Nunheimer, T. D., 698.
 Nuttall, G. H. F., 101.
 Nybrotten, N., 402.
 Nyhus, P. O., 256.
 Nylund, R. E., 53.
 Nyman, B., 743.
 Oakes, H., 736.
 O'Bannon, L. S., 177.
 Obenshain, J. D., 141.
 Oberg, K., 683.
 Oboussier, H., 788.
 O'Brien, J. R., 282.
 Ocfemia, G. O., 60.
 Ochsner, A., 703.
 O'Conner, R. T., 730.
 O'Dell, B. L., 510.
 Odell, R. T., 590.
 Oderkirk, A. D., 382.
 Oderkirk, G. C., 212.
 Odland, T. E., 36, 188, 327.
 O'Donovan, J., 257.
 O'Droma, L., 521.
 Oehser, P. H., 355.
 Offord, H. R., 638.
 Ogburn, W. F., 411.
 Ogier, T. L., 445.
 Ogle, L., 3.
 Ogonuki, H., 671.
 O'Kane, D. J., 806.
 O'Kane, W. C., 360.
 O'Kelly, J. F., 34, 319, 755.
 Okey, R., 841.
 Olcott, H. S., 325.
 Olcott, M. T., 262.
 Olds, H. F., 642.
 Oleson, J. J., 421, 660, 693, 803.
 Oliveira, J. M., 70, 489.
 Oliver, A. W., 109.
 Olmo, H. P., 335.
 Olsen, M. W., 173, 511.
 Olsen, O. W., 103, 641.
 Olson, C., Jr., 107.
 Olson, F. R., 455, 848.
 Olson, L. C., 178.
 Olson, M. B., 548.
 Olson, O. E., 22, 727, 813.
 Olson, R. A., 16, 162.
 Olson, R. E., 786.
 Olson, T. M., 806.
 Olson, W. S., 442.
 Ondratschek, K., 742.
 O'Neal, W. C., 787.
 O'Neill, J. P., 824.
 Ong, E. R. de, 486.
 Opie, R. S., 488.
 Orecutt, F. S., 665.
 O'Rear, H. M., 671.
 Orent-Kelles, E., 699.
 Oria-Jensen, S., 239.
 Ortlepp, R. J., 101, 523, 814.
 Orton, C. R., 144, 859.
 Osborn, R. A., 729.
 Osteen, O. L., 388.
 Osterberg, A. E., 715.
 Osterhout, W. J. V., 160.
 Otis, C. K., 288.
 Otis, L., 276.
 Otto, G. F., 716.
 Outhouse, J., 845.
 Overbeek, J. van, 20.
 Overholser, E. L., 49.
 Overholser, M. D., 174.
 Overley, F. L., 49.
 Overman, O. R., 582.
 Overman, R., 669.
 Overstreet, R., 166, 595.
 Owen, E. C., 128.
 Owen, F. V., 467.

- Owen, W. L., Jr., 787.
 Ownbey, M., 592.
 Oxford, A. E., 596.
- Pace, J., 93.
 Pacheco, S. D., 124.
 Packard, C. M., 366.
 Packchianian, A., 391, 393.
 Padgett, L. J., 493.
 Page, A. B. P., 79.
 Page, E., 227, 384, 805.
 Page, E. M., 469.
 Page, J. C., 70, 829.
 Painter, H. R., 212.
 Painter, R. H., 358, 501, 502.
 Palicte, L. J., 518.
 Pallt, B. K., 446.
 Palm, C. E., 86, 359, 371, 786.
 Palmer, C. C., 388.
 Palmer, C. E., 842.
 Palmer, J. W., 102.
 Palmer, L. S., 239, 416, 809.
 Palmer, M. A., 364.
 Palmer, R. G., 628.
 Palmer, W. C., 287.
 Palmer-Jones, T., 870.
 Falmitt, D. H., 66, 630.
 Palo, M. A., 60.
 Pålsson, H., 91.
 Pande, P. G., 246.
 Pappenheimer, A. M., 373.
 Paranjothy, J. T., 669.
 Parfitt, E. H., 235, 240, 519, 664, 729.
 Parija, P., 17.
 Paris, C. D., 388.
 Parish, H. E., 74.
 Park, M., 634.
 Park, T., 793.
 Parker, B. M., 77, 360, 498.
 Parker, J. H., 502.
 Parker, K. G., 504, 629, 769.
 Parker, L. B., 503, 785.
 Parker, M. M., 186, 591.
 Parker, R. L., 75, 220, 501.
 Parker, W. E., 510.
 Parkes, A. S., 173, 609.
 Parkins, J. H., 736.
 Parks, H. B., 757, 787.
 Parks, T. H., 74, 215, 358.
 Parman, D. C., 358.
 Parnell, I. W., 244, 820.
 Parodi, L. R., 593.
 Parr, T., 647.
 Parrott, I. M., 752.
 Parrott, P. J., 579, 718.
 Parry Jones, E., 83.
 Parshall, M., 678.
 Parsons, F. L., 541.
 Parsons, F. S., 219, 366.
 Parsons, H., 693.
 Parsons, H. T., 755.
 Parsons, P. B., 390.
 Partridge, N. L., 454.
 Parvin, D. W., 405, 430.
 Paschka, K. E., 749.
 Pasqua, M. R., 522.
- Passecker, F., 761.
 Pastore, A. I., 593.
 Pate, W. W., 829.
 Paterson, J. S., 672.
 Paton, R. R., 478.
 Patrick, H., 506, 510.
 Patrick, S., 470, 480.
 Patrick, S. R., 470.
 Patton, A. R., 511, 587.
 Patton, R. L., 597.
 Patty, R. L., 823.
 Patzer, W. E., 479, 766.
 Paul, B. H., 479.
 Paul, W. D., 137.
 Paulhus, N. G., 511.
 Paulson, W. E., 325, 401, 681, 823.
 Pavlychenko, T. K., 329.
 Payne, G. T., 730.
 Payne, L. F., 462.
 Pearce, G. W., 643.
 Pearce, S. C., 217.
 Pearl, R., 288, 793.
 Pearson, A. M., 73.
 Pearson, G. A., 480.
 Pearson, P. B., 795, 799.
 Pearson, R. W., 301.
 Pease, R. W., 795.
 Pecher, C., 808.
 Pedelty, W. H., 379, 660.
 Pederson, C. S., 152.
 Peech, M., 431.
 Peele, T. C., 177.
 Peet, L. J., 574.
 Peevy, W. J., 591.
 Peikert, F. W., 142.
 Pellico, A. B., 17.
 Pencharz, R. I., 459.
 Penczek, E. S., 243, 812.
 Penn, R. J., 411.
 Pennak, R. W., 595.
 Pennell, M. Y., 856.
 Pennell, R. B., 245.
 Penner, C. M., 585.
 Penquite, R., 382, 511, 516, 795.
 Pentzer, W. T., 44.
 Peralta, F. de, 60.
 Percival, W. C., 736, 766.
 Perkins, A. E., 797.
 Perkins, A. T., 729.
 Perkins, M., 687.
 Perlman, J. L., 729.
 Persing, C. O., 362.
 Person, L. H., 350.
 Perszelan, J., 217.
 Petering, H. G., 190.
 Peters, C. C., 858.
 Peters, D. D., 699.
 Peters, J. L., 213.
 Petersen, W. E., 663.
 Peterson, A. G., 623, 789.
 Peterson, A. W., 827.
 Peterson, E. G., 5.
 Peterson, H. B., 861.
 Peterson, M. L., 824.
 Peterson, R. F., 62, 313.
- Peterson, R. T., 213.
 Peterson, W., 144.
 Peterson, W. H., 662, 664, 772, 828, 848.
 Peterson, W. J., 419.
 Petlyuk, P. T., 646.
 Pett, L. B., 129, 702.
 Petterssen, S., 441.
 Pettit, G. H. N., 384.
 Pettit, J. H., 608.
 Peturson, B., 345.
 Pfeiffer, N. E., 338.
 Pharis, L. L., 463.
 Phelps, E., 717, 856.
 Phifer, L. D., 592.
 Phillips, A., 781.
 Phillips, J. S., 791.
 Phillips, L. R., 278.
 Phillips, M., 7, 727.
 Phillips, M. O., 402.
 Phillips, P., 669, 693.
 Phillips, P. H., 173, 508.
 Phillips, R. E., 382.
 Phillips, R. W., 374, 381, 536, 657.
 Phillips, T. G., 326.
 Phillips, W. J., 649.
 Phillis, E., 449, 450.
 Pickel, D. B., 487.
 Pickens, M., 845.
 Pickett, A. D., 222.
 Pickett, B. S., 471, 757, 836.
 Pickett, T. A., 720.
 Pickett, W. F., 189.
 Pickles, A., 501.
 Pierce, C. W., 537.
 Pierce, H. B., 552.
 Piercy, P. L., 813.
 Pierpont, R. L., 359.
 Pierre, W. H., 301.
 Pierson, A. H., 480.
 Pierson, E. M., 847.
 Piester, E. A., 630.
 Pinckard, J. A., Jr., 576.
 Pinckney, J. S., 505.
 Pincus, G., 30, 174.
 Piper, C. S., 60.
 Piper, S. E., 641.
 Pirone, P. P., 211, 627, 628, 630, 769, 779, 780.
 Pitner, J., 15, 319, 755.
 Pittman, D. W., 861.
 Pittman, K., 70.
 Pladeck, M. M., 87.
 Plagge, J. C., 175.
 Plakidas, A. G., 354, 629, 631.
 Plank, H. K., 74, 81.
 Plank, J. E. van der, 778.
 Plant, W., 453.
 Plastridge, W. N., 246, 527, 676, 816.
 Platenius, H., 759.
 Platt, B. S., 133, 134.
 Platt, C. S., 511.
 Platz, B. R., 422.
 Plitt, T. M., 139.
 Plioth, O. v., 342.

- Poe, C. F., 782.
 Poelma, L. J., 396.
 Poffenberger, P. R., 407.
 Pohjakallio, O., 321.
 Pohlman, G. G., 736, 754, 807.
 Polderboer, E. B., 783.
 Poley, W. E., 510, 511, 802, 837.
 Poling, C. E., 709.
 Poling, E. B., 263.
 Polk, H. D., 512.
 Pollard, M., 251, 821.
 Pollinger, W. E., 612, 617.
 Pollock, E. O., 226.
 Pollock, B. C., 90.
 Polunin, N., 593.
 Pomerleau, R., 69.
 Pomeroy, B. S., 389.
 Poncher, H. G., 569.
 Pontecorvo, G., 517.
 Pontis, R. E., 64.
 Poole, R. F., 144.
 Poor, M. E., 217, 499.
 Poos, F. W., 369.
 Pope, J. B., 823.
 Popp, H. W., 17, 471.
 Popper, H., 558.
 Porter, C. L., 455.
 Porter, D. D., 181.
 Porter, D. R., 596.
 Porter, M. C., 694.
 Porter, R. A., 110.
 Porter, R. H., 470.
 Porter, T., 281.
 Post, A. H., 612.
 Post, K., 164, 104, 765.
 Poston, M. A., 390.
 Potapenko, J. I., 599.
 Potter, G. F., 405.
 Potter, P. B., 286.
 Potter, R. L., 524.
 Potter, V. R., 276.
 Potts, S. F., 75, 493.
 Poivin, A., 731.
 Potzger, J. E., 447.
 Powell, W., 827.
 Poyet, E. B., 427.
 Prado, F. V., 602.
 Pratt, A. D., 235.
 Pratt, H. D., 224.
 Pratt, I., 106.
 Pratt, R., 162.
 Prebble, J. S., 651.
 Preheim, D. V., 461.
 Prescott, G. W., 595.
 Presnall, C. C., 70.
 Preston, C., 167.
 Price, A. G., 154.
 Price, F. E., 109.
 Price, M. R., 849.
 Price, R., 687.
 Price, W. A., 329, 332.
 Price, W. C., 344, 481, 629.
 Price, W. V., 663.
 Pridham, A. M. S., 765.
 Prince, A. E., 772.
 Prince, A. L., 582.
 Prince, F. S., 326.
 Prouty, C. C., 238.
 Provan, J. L., 336.
 Provinse, J. S., 290.
 Prucha, M. J., 519, 809.
 Pruthi, H. S., 225.
 Pryor, D. E., 483, 769.
 Pucher, G. W., 164.
 Puhr, L. F., 735.
 Pullar, E. M., 252, 676.
 Punnett, R. C., 607.
 Purvis, E. R., 582, 591, 759.
 Putnam, D. N., 808.
 Putnam, P. L., 405, 511.
 Puttemans, A., 771.
 Pyenson, L., 649.
 Pyke, W. E., 295, 414, 511.
 Quackenbush, F., 693.
 Quayle, H. J., 790.
 Quesenberry, J. R., 254, 608, 655, 668.
 Quick, A. J., 715.
 Quieroz, L., 721.
 Quinby, J. R., 752, 787.
 Quinlan, L. R., 34.
 Quinn, J. P., 511.
 Quintus, P. E., 832.
 Quisenberry, J. H., 457, 748.
 Rabstein, M., 388.
 Rada, G. G., 487.
 Radchenko, S. I., 599.
 Rademacher, B., 329.
 Raeder, J. M., 342, 350.
 Ragland, C. H., 52, 334.
 Rahman, K. A., 363, 496, 788.
 Rahn, E. M., 471, 472.
 Rahn, O., 311, 805.
 Rai Sircar, B. C., 416.
 Rainboth, E. D., 856.
 Rainwater, C. F., 494.
 Raktakanishta, X., 60.
 Raleigh, G. J., 204, 759.
 Ralli, E. P., 850.
 Ralph, P. H., 602.
 Raman, P. K., 11.
 Ramdas, L. A., 11.
 Ramsay, M., 786.
 Ramsey, G. B., 342.
 Ramsower, H. C., 5.
 Randall, P. E., 492, 495, 536.
 Randle, S. B., 693.
 Randolph, L. F., 751.
 Randolph, T. B., 770, 787.
 Randolph, U. A., 725, 757.
 Rankin, W. H., 629.
 Ranson, S. W., 173.
 Rao, M. A. N., 73.
 Rao, S. G., 11.
 Rapaport, H. G., 559, 852.
 Raper, J., 593.
 Raper, K. B., 160.
 Raper, P. A., 226.
 Raskopf, B. D., 33, 264, 268.
 Rasmussen, G. L., 18.
 Rasmussen, K., 800.
 Rasmussen, M. P., 408, 827.
 Rasmussen, R. A., 884.
 Ratcliffe, H. E., 541.
 Ratcliffe, H. L., 315.
 Ratera, E. L., 169, 313.
 Ratnam, V. D., 250.
 Ratner, B., 843.
 Ratsek, J. C., 195, 196, 338, 477, 757.
 Rattray, J. M., 778.
 Rau, P., 790.
 Rauchenstein, E., 831.
 Rawl, E. H., 621.
 Rawles, M. E., 462.
 Rawlings, R. E., 632.
 Rawlins, W. A., 216, 369, 786.
 Rawson, D. S., 595.
 Rawson, R. W., 32.
 Ray, S. C., 373, 374.
 Ray, W. W., 212, 780.
 Raymond, W. D., 274.
 Rayner, M. C., 159.
 Raynor, R. N., 329.
 Rea, H. E., 325, 752, 770.
 Read, B. E., 703.
 Readlo, P. A., 370.
 Rebrassier, R. E., 388.
 Rector, R. R., 510, 516.
 Recknagel, A. B., 766.
 Reddick, D., 485, 769.
 Reddy, C. H., 819.
 Reder, R., 795.
 Redfield, G., 268, 286.
 Redfield, R., 687.
 Redlich, G. C., 155.
 Reece, R. P., 176.
 Reed, C. F., 593.
 Reed, F. H., 92.
 Reed, H. J., 147, 287.
 Reed, H. M., 725, 757.
 Reed, I. F., 177.
 Reed, O. E., 662.
 Reed, R. H., 466.
 Reed, W. D., 357.
 Reedman, E. J., 562.
 Reeves, E. L., 58.
 Reeves, R. G., 752.
 Refuerzo, P. G., 533.
 Regeimbal, L. O., 473, 474, 619.
 Rehling, C. J., 592.
 Reichelderfer, F. W., 734.
 Reid, D. H., 782.
 Reid, J. J., 480, 481, 745.
 Reid, M. E., 16.
 Reid, W. H. E., 240, 410, 812.
 Reid, W. J., Jr., 494.
 Reineccius, J. L., 819.
 Reinhard, H. J., 787.
 Reinking, O. A., 205.
 Remsberg, R. E., 311.
 Rendel, J. M., 457.
 Renne, R. E., 112, 538, 829.
 Renner, F. G., 687.
 Resende, F., 745.
 Rest, L., 242.

- Bettger, L. F., 246.
 Reuss, C. F., 119, 411.
 Reuther, C. F., 119, 411.
 Reuther, W., 50, 51, 209, 761.
 Rex, E. G., 68, 651.
 Reyes, G. M., 60.
 Reyes, N. C., 229.
 Reynolds, E. B., 752, 806.
 Reynolds, H., 617.
 Reynolds, L., 548.
 Reynolds, R. V., 480.
 Rhian, M., 524.
 Rhoades, M. M., 312.
 Rhoads, J. E., 715.
 Rhode, C. S., 385.
 Rice, E. E., 132.
 Rice, J. E., 231.
 Rice, W. N., 470, 481.
 Rich, H., 735, 770.
 Rich, S. 58.
 Richards, B. L., 629, 630, 635.
 Richards, C. A., 489.
 Richards, D. E., 91, 229.
 Richards, E. H., 432.
 Richards, L. W., 56.
 Richards, M. B., 127, 131.
 Richards, M. C., 59.
 Richards, O. W., 16, 792.
 Richardson, C. H., 498, 644, 649.
 Richardson, J. E., 122, 423, 424, 693, 717.
 Richardson, L. R., 382, 417, 506, 510, 851.
 Richey, C. B., 432.
 Richey, H. W., 471.
 Richmond, T. R., 752.
 Richter, C. F., 697.
 Richter-Altschaffer, J. H., 681.
 Rick, C. M., 288.
 Rick, J., 161.
 Rick, R., 160.
 Riddet, W., 811.
 Riddle, O., 319.
 Ridenour, G. M., 432.
 Riegel, B., 439.
 Riehm, E., 58.
 Rieinan, G. H., 500.
 Rietz, J. H., 796.
 Rietz, R. C., 198.
 Rigg, G. B., 592, 595.
 Riggert, E., 788.
 Riggs, J. K., 658, 795.
 Rigler, N. E., 603, 633, 770, 771.
 Rigor, T. V., 518, 658.
 Riherd, P. T., 787.
 Riker, A. J., 603, 629, 772.
 Riley, G. M., 511.
 Riley, H. P., 592.
 Riley, W. A., 220, 506.
 Rinehart, E. F., 372.
 Ringen, J., 796.
 Ringrose, A. T., 510, 803.
 Ringsted, A., 714.
 Rippel, A., 342.
 Ritcher, P. O., 74, 357, 785.
 Ritchey, G. E., 178.
 Ritchie, W. S., 551, 839.
 Rittenberg, D., 164.
 Ritz, N. D., 427.
 Rivera, M. I., 617.
 Riverin, B., 610.
 Rivers, P. W., 811.
 Roach, J. R., 150.
 Roach, W. A., 449.
 Roadhouse, C. L., 98.
 Roehen, D. C., 239.
 Roark, R. C., 494.
 Robbie, W. A., 790.
 Robbins, R. C., 412, 425, 711.
 Robbins, W. J., 304, 305, 593, 596.
 Robbins, W. W., 594.
 Roberts, C. A., 802.
 Roberts, E., 457, 748.
 Roberts, F. H. S., 252, 817.
 Roberts, G. A., 672.
 Roberts, J. E., 752, 770.
 Roberts, J. L., 154, 455.
 Roberts, J. W., 352.
 Roberts, R. E., 227, 233.
 Roberts, W. L., 814.
 Robertson, D., 396.
 Robertson, D. W., 324.
 Robertson, E. I., 381, 518, 516, 661.
 Robertson, G. G., 174.
 Robertson, L., 265, 404.
 Robertson, L. S., 256.
 Robeson, C. D., 438.
 Robinson, E. C., 712.
 Robinson, E. M., 101, 814.
 Robinson, E. R., 740.
 Robinson, H. J., 567.
 Robinson, J. M., 73.
 Robinson, T. H., 688.
 Robinson, T. R., 837.
 Robinson, W., 524.
 Robison, W. L., 755.
 Robotka, F., 408.
 Robson, J. M., 750.
 Rodenhiser, H. A., 28, 773.
 Rodgers, J. B., 399.
 Roepke, M. H., 390, 527, 671.
 Roesner, E. H., 782.
 Roets, G. C. S., 524.
 Rogers, A. M., 401.
 Rogers, C. H., 325, 752, 770.
 Rogers, H. J., 527.
 Rogers, R. E., 513.
 Rogers, T. A., 756.
 Rogers, W. P., 816.
 Roggenbrod, R., 325.
 Rogler, C. C., 690.
 Rohwer, C., 678.
 Roland, G., 206.
 Roldan, E. F., 60.
 Rolf, L. A., 852.
 Rollins, H. A., 297.
 Romano, A. L., 382, 511, 516, 747.
 Romshe, F. A., 752, 757.
 Roney, J. N., 786.
 Rooke, E. A., 380.
 Root, C. J., 153.
 Rork, R., 843.
 Rosa-Mato, F., 160.
 Rosborough, J. F., 757.
 Rose, C. S., 587.
 Rose, J. J., 873.
 Rose, J. K., 602.
 Rose, M. S., 693, 694.
 Rose, W. C., 132.
 Rosen, H. R., 199, 630, 779.
 Rosenberg, L. E., 253.
 Rosenblum, L. A., 708.
 Rosenquist, A., 837.
 Rosenthaler, L., 151.
 Rosenwald, A. S., 389.
 Roskelley, R. W., 690, 834.
 Ross, E. J., 262.
 Ross, H. H., 503.
 Ross, R. H., 808.
 Ross, W. A., 412, 642.
 Rossouw, S. D., 800.
 Roth, E. R., 627.
 Rothchild, I., 318.
 Rothen, A., 458.
 Rouse, E. T., 496.
 Rousseau, J., 159.
 Roux, E. R., 449, 762.
 Rowe, S. C., 414, 729.
 Rowe, W. H., 687.
 Rowland, S. J., 517.
 Rowlands, I. W., 30.
 Rowlands, W. T., 246, 396.
 Rozeboom, L. E., 786.
 Rubel, D. M., 687.
 Ruben, S., 595, 603.
 Rubin, B. A., 665.
 Rubin, H. L., 530.
 Rubinstein, H. S., 175, 817, 461, 608.
 Ruddiman, E. A., 183.
 Rudert, F. J., 806.
 Rudolph, W., 712.
 Rudolph, W. M., 70.
 Rudy, W. J., 676.
 Ruegger, A., 728.
 Ruehle, G. D., 485, 486, 636.
 Ruehle, G. L. A., 719.
 Ruiz, H., 220.
 Rule, G. K., 300.
 Rumbold, C. T., 629.
 Runnels, T. D., 510, 511, 796.
 Rupel, I. W., 173, 662, 669.
 Rush, J. D., 261.
 Ruska, H., 430.
 Russell, D. S., 247.
 Russell, G. A., 244, 787.
 Russell, E. R., 670.
 Russell, W. C., 144, 582, 807.
 Rusk, H. P., 722.
 Rutledge, E. H., 70, 829.
 Ruttle, M. L., 617.
 Ryan, B., 681.
 Ryan, L. T., 729.
 Ryan, P. E., 119.
 Rydeen, J. O., 702.
 Ryerson, K. A., 4, 149.

- Ryff, J. F., 528.
 Ryker, T. C., 605, 629.
 Sabrosky, C. W., 642.
 Sachtleben, H., 58.
 Sadasivan, T. S., 200.
 Sadvosky, A., 136.
 Sadr, M. M. El, 538.
 Saffry, O. B., 564.
 Sagara, T., 439.
 Sabai, L., 525.
 St. George, R. A., 354.
 St. John, J. L., 729.
 Saiyananda, C., 635.
 Sako, Y., 317.
 Sakshaug, B., 321.
 Salafranca, E. S., 535.
 Sale, J. W., 143.
 Salisbury, G. W., 397, 610, 747, 813.
 Salisbury, H. F., 738.
 Sallans, B. J., 62.
 Salmon, W. D., 131.
 Salter, L. A., Jr., 255, 692, 829.
 Salter, R. M., 320.
 Salter, W. T., 32.
 Samantarai, B., 17.
 Sampson, H. C., 445.
 Sampson, J., 230, 249.
 Sampson, K., 632.
 Sampson, W. L., 139, 440, 562.
 Sampson, W. W., 500.
 Samson, R. W., 199, 350.
 Samuel, G., 634.
 Samuels, L. T., 427.
 Sanborn, B. G., 616.
 Sanders, A. P., 419.
 Sanders, D. A., 394.
 Sanders, El., 492.
 Sanders, G. P., 241.
 Sanders, I. T., 266.
 Sanderson, D., 689, 834.
 Sanderson, K. M., 389.
 Sanderson, M. W., 504.
 Sandholzer, L. A., 808.
 Sandstedt, R. M., 729.
 Sanford, G. B., 482.
 Sanguineti, M. E., 604.
 Santos, J. K., 17.
 Sarle, C. F., 253.
 Sass, J. E., 169.
 Satakopan, V., 11.
 Satterfield, G. H., 236, 283, 423, 512, 513, 565, 846.
 Saunders, J. M., 325.
 Sanderson, M. H., 114.
 Savage, E. F., 474, 761.
 Savage, E. S., 384, 747, 805.
 Savilla, D., 570.
 Sawyer, J., 247.
 Saxton, J. A., 795.
 Sayers, B. R., 644.
 Saylor, L. W., 213.
 Sayre, C. B., 188, 204, 332, 473, 590.
 Sayre, J. D., 793.
 Scales, F. M., 812.
 Scarisbrick, R., 165.
 Scarseth, G. D., 154, 178.
 Schaars, M. A., 682.
 Schaeppi, H., 169.
 Schaerffenberg, B., 788.
 Schaible, P. J., 95, 511.
 Schalk, A. F., 388, 799.
 Schaller, F. W., 783, 754.
 Schantz, E. G., 664.
 Schantz, E. J., 413.
 Schaub, I. O., 5.
 Schaus, W., 219.
 Scheffer, T. C., 490.
 Schermerhorn, L. G., 182, 186.
 Schiel, E., 200.
 Schimitschek, E., 788.
 Schleicher, E. M., 18.
 Schlenker, F. S., 164, 306.
 Schloemer, A., 540.
 Schmidt, C. M., 22.
 Schmidt, F. L., 783.
 Schmidt, G., 493.
 Schmidt, H., 229, 795, 799, 813.
 Schmidt, W., 842.
 Schneider, C. L., 17.
 Schneider, H., 422.
 Schneider, I., 610.
 Schneider, I. F., 260.
 Schmitter, R., 729.
 Schnetzler, E. E., 173, 532.
 Schoch, E. P., 325.
 Schoenheimer, R., 164.
 Schoenheimer, S. G., 172, 313.
 Schoening, H. W., 388.
 Schoenleber, L. H., 442.
 Schoffelmayer, V. H., 325.
 Schofield, F. W., 388.
 Schofield, R. K., 12.
 Scholl, E. E., 144.
 Schubert, A. B., 656.
 Schubert, H. J., 589.
 Schunette, H. A., 666.
 Schunhardt, V. T., 228.
 Schulman, E., 296.
 Schultz, A. S., 171.
 Schultz, E. S., 349.
 Schultz, T. W., 3, 261.
 Schulz, K., 523.
 Schumacher, A. E., 94, 151, 514, 860.
 Schuster, C. E., 55, 468.
 Schwab, G., 728.
 Schwardt, H. H., 786.
 Schwartz, L. H., 819.
 Schwartz, B., 388.
 Schwarz, E. R., 139.
 Schweitzer, C. E., 439.
 Schweitzer, T. R., 161, 293.
 Schwerdtfeger, F., 783.
 Schwickerath, M., 595.
 Scofield, C. S., 444, 449.
 Scotland, M. B., 655.
 Scott, C. E., 628.
 Scott, C. L., 429.
 Scott, D. B., 729, 731.
 Scott, D. H., 621.
 Scott, H. M., 283, 382, 513, 515, 576, 805.
 Scott, L. B., 82.
 Scott, T. G., 490, 492.
 Scott Blair, G. W., 517, 522.
 Seoville, G. P., 827.
 Scudi, J. V., 562.
 Scullen, H. C., 653.
 Seabra, A. F. de, 789.
 Seamans, A. E., 587, 612, 655.
 Searls, E. M., 353.
 Seaton, H. L., 194.
 Seaton, L., 785.
 Seaver, F. J., 344.
 Sebrell, W. H., 707.
 Secor, W., 156.
 Seeger, K. C., 510.
 Seekles, L., 294.
 Seeler, E. V., Jr., 68.
 Seeley, J. G., 195.
 Seely, C. I., 69, 319.
 Seghetti, L., 245.
 Seibold, H. R., 674.
 Seifer, H. F., 59.
 Seiferle, E. J., 644.
 Seifritz, W., 593.
 Seftienok, N. A., 525.
 Seitz, C. E., 589.
 Seleen, W. A., 806.
 Selga, M., 11.
 Sellman, A. M., 569.
 Sell, O. E., 178, 321.
 Selle, R. M., 698.
 Sellers, W. F., 654.
 Selye, H., 31, 460, 461, 609.
 Semenjuk, G., 629.
 Senior, B. J., 376.
 Serrallés, J. J., Jr., 265.
 Sevanaer, C. M. O. van N. tot, 256.
 Severin, H. C., 499, 786.
 Severin, H. H. P., 485.
 Sewell, W. H., 544, 834.
 Shackelford, M., 748.
 Shaffner, C. S., 511.
 Shahan, M. S., 388.
 Shalucha, B., 17.
 Shands, W. A., 493, 494, 652.
 Shaner, M. L., 507.
 Shannon, W. J., 731.
 Shanor, L., 627.
 Shantz, H. L., 70.
 Shapovalov, M., 65, 481.
 Sharp, D. G., 531, 675.
 Sharp, E. A., 715.
 Sharp, P. F., 100, 336, 521, 666, 805, 810.
 Sharpless, G. R., 705.
 Sharvella, E. G., 629.
 Shattock, P. M. F., 808.
 Shaw, B. T., 288.
 Shaw, F. R., 642.
 Shaw, G. E., 293.

- Shaw, J., 693.
 Shaw, J. C., 663.
 Shaw, J. N., 245.
 Shaw, K. J., 499, 627, 629.
 Shaw, R. R., 143.
 Shaw, R. S., 861.
 Shaw, W. M., 582.
 Shay, H., 749.
 Shear, C. L., 772.
 Shear, G. M., 741.
 Sheard, C., 130.
 Shedlovsky, T., 458.
 Sheeley, M., 16.
 Sheets, E. W., 507.
 Sheets, O., 127, 427.
 Shelton, F. A., 332.
 Shema, B. F., 629.
 Shepard, C. E., 228.
 Shepardson, C. N., 806, 813.
 Shepherd, A. D., 193.
 Shepherd, G., 678.
 Shepherd, J. L., 142.
 Shepherd, M. L., 550, 551.
 Sheppard, P. A., 536.
 Sherbakoff, C. D., 489.
 Sherman, H. C., 841.
 Sherman, J. M., 520, 806, 816.
 Sherman, R. W., 265.
 Sherman, W. C., 731.
 Sherwood, R. M., 232, 796.
 Shettles, L. B., 569.
 Shields, R. H., 256.
 Shils, M., 706.
 Shipman, H. J., 361.
 Shirck, F., 357.
 Shirk, H. G., 599.
 Shive, J. W., 25.
 Sholl, L. B., 388.
 Shope, P. F., 480.
 Shorb, D. A., 105, 214.
 Shorrock, R. W., 231, 509.
 Short, L. M., 119.
 Shotwell, R. L., 785.
 Shough, W. W., 503.
 Shourie, K. L., 707.
 Showalter, J. W., 628, 790.
 Showalter, R. K., 185.
 Shrewsbury, C. L., 150, 227.
 Shrigley, E. W., 29.
 Shull, C. A., 295.
 Shull, W. E., 357.
 Sicular, A., 352.
 Sideris, A. D., 256.
 Siegel, E. H., 554, 555.
 Siegler, E. A., 66, 352.
 Sievers, A. F., 244.
 Sievers, F. J., 146.
 Sikes, E. W., 720.
 Silow, R. A., 604.
 Silva, S. G. da, 200, 211.
 Silveira, V. D., 202.
 Silverman, M., 455.
 Silversides, W. H., 43.
 Simcox, W. J., 552.
 Simkovitch, D., 448.
 Simmons, J. E., 67.
 Simms, H. D., 419.
 Simon, F., 535.
 Simons, L. R., 144.
 Simonson, R. W., 298.
 Simpson, D. M., 177.
 Simpson, I. A., 278.
 Simpson, M. E., 458.
 Sims, V. M., 690.
 Sinclair, H. M., 9, 704.
 Sindén, J. W., 471.
 Singer, A. J., 306.
 Singh, R., 42.
 Singh Sohi, G., 788.
 Singleton, W. R., 47, 456, 745.
 Sinha, S., 200.
 Sipe, G. R., 226, 512.
 Sircar, B. C. R., 416.
 Sircar, S. M., 17.
 Sirrine, E. F., 469.
 Sisson, L. L., 22.
 Sitnikova, G. M., 203.
 Sitterley, J. H., 755.
 Sitton, B. G., 758.
 Sjolander, N. O., 381.
 Sjöstedt, G., 585.
 Skelley, W. C., 659.
 Skelton, F. M., 664.
 Skinkle, J. H., 717.
 Skinner, H. T., 196, 765.
 Skinner, J. H., 287.
 Skinner, W. W., 143.
 Skiver, C. E., 178.
 Skoog, F., 17, 20.
 Slabaugh, R. E., 216.
 Slade, H. D., 455.
 Slanetz, L. W., 395.
 Slate, G. L., 193, 487.
 Slate, W. L., 575.
 Slater, D. J., 659.
 Slesman, J. P., 216.
 Slipper, J. A., 755.
 Sloan, H. J., 511.
 Sloane, J. E. N., 897.
 Small, T., 209.
 Smalley, H. R., 177.
 Smart, J., 74.
 Smiley, K. L., 806.
 Smith, A. D., 91, 296.
 Smith, A. H., 126.
 Smith, A. L., 341, 489.
 Smith, A. M., 797.
 Smith, C., 835.
 Smith, C. C., 447, 491.
 Smith, C. F., 360, 501.
 Smith, C. O., 772.
 Smith, D. M., 172.
 Smith, E. C., 26.
 Smith, E. N., 834.
 Smith, E. V., 33, 73, 226.
 Smith, E. Y., 516.
 Smith, F. B., 591.
 Smith, F. F., 67, 73, 211, 369, 476.
 Smith, F. R., 665, 816, 818.
 Smith, F. V., 256.
 Smith, G. D., 156, 442.
 Smith, G. E. P., 399.
 Smith, G. L., 371, 494.
 Smith, G. M., 200.
 Smith, G. R., 544, 684.
 Smith, H. H., 536.
 Smith, H. M., 156, 735.
 Smith, H. P., 752, 823.
 Smith, H. S., 792.
 Smith, I., 18.
 Smith, J., 548.
 Smith, J. A., 576.
 Smith, J. B., 143, 582, 729.
 Smith, J. G., 193, 623.
 Smith, J. H. C., 74.
 Smith, J. R., 418.
 Smith, J. R., 402.
 Smith, J. T., 183.
 Smith, K. M., 631.
 Smith, K. U., 602.
 Smith, L. F., 341, 624.
 Smith, L. H., 156, 442.
 Smith, L. K., 687.
 Smith, L. R., 299, 442.
 Smith, M. C., 276, 703, 846.
 Smith, M. C., 256.
 Smith, M. I., 102.
 Smith, M. R., 81.
 Smith, N. C., 179.
 Smith, N. F., 795.
 Smith, O., 182, 326, 327, 451, 751.
 Smith, P. A., 806.
 Smith, P. G., 439, 484.
 Smith, P. H., 740, 798.
 Smith, R. A., 682.
 Smith, R. C., 495, 687.
 Smith, R. E., 357.
 Smith, R. H., 218, 642.
 Smith, R. M., 226, 655.
 Smith, R. S., 442, 829.
 Smith, R. W., 71, 180, 497.
 Smith, S. E., 93, 610, 660, 747, 781, 820.
 Smith, S. L., 3, 144, 145.
 Smith, T. E., 629.
 Smith, T. F., 781.
 Smith, T. L., 266.
 Smith, T. O., 656.
 Smith, W. K., 324, 814.
 Smith, W. W., 50.
 Smock, R. M., 191, 761.
 Smucker, S. J., 488, 629.
 Smuts, D. B., 798, 799.
 Snapp, O. I., 494, 642.
 Snedecor, G. W., 858.
 Snell, E. H., 22.
 Snell, G. D., 606.
 Snipes, B. T., 219.
 Snyder, H. B., Jr., 11.
 Snyder, M. H., 469.
 Snyder, R. S., 319, 357, 825.
 Snyder, W. C., 53, 342, 843.
 Sobel, A. E., 438, 699.
 Sober, H. A., 693.
 Soderwall, A. L., 480.
 Sohi, G. S., 788.
 Sokhey, S. S., 416.
 Solin, L., 409.

- Soliven, F. A., 10.
 Solomon, M. L., 317.
 Sommer, A. L., 13.
 Sommer, H. H., 98, 239, 664.
 Sookne, A. M., 855.
 Sorauer, P., 58.
 Soskin, S., 173, 697.
 Sotola, J., 797.
 Souders, H. J., 548, 844.
 Southwell, B. L., 226, 231, 659.
 Southwick, F. W., 210.
 Southwick, L., 51.
 Sowell, D. F., 226.
 Spafford, I., 268.
 Spain, L. A., 645.
 Spanier, F. H., 469.
 Sparlin, E. E., 111, 141.
 Spawn, G. B., 736.
 Spears, H. S., 373.
 Speck, M. L., 805.
 Spector, H., 846.
 Spencer, D. A., 748.
 Spencer, E. L., 15, 629.
 Spencer, H. J., 74, 641.
 Spencer, L., 827.
 Spencer, R., 106.
 Spencer, W. T., 388.
 Sperling, G., 31, 795.
 Spiegelberg, C. H., 733.
 Spillers, A. R., 197.
 Spindler, L. A., 214.
 Spizizen, J., 21.
 Sprague, G. F., 614.
 Sprague, H. B., 37, 324, 740.
 Sprague, M. A., 576.
 Sprague, R., 59.
 Spry, R., 301.
 Spurr, A. R., 592.
 Spurr, S. H., 739.
 Spurway, C. H., 595.
 Squire, F. A., 81.
 Staebner, F. E., 824.
 Stafford, E., 786.
 Stafseth, H. J., 677.
 Stahl, A., 208.
 Stahl, C. A., 469.
 Stahmann, M., 669.
 Stains, G. S., 221, 787.
 Stair, C. C., 185.
 Stair, E. C., 188.
 Staker, E. V., 735.
 Staley, K., 742.
 Stamberg, O. E., 438.
 Standen, J. H., 629.
 Standing, E. T., 628.
 Stanley, A. J., 315.
 Stanley, L., 3, 144, 145.
 Stanley, R. D., 729.
 Stanley, W. M., 207, 208.
 Stanley, W. W., 792.
 Stannus, H. S., 709.
 Stansel, R. H., 752, 757.
 Stanton, T. R., 27, 346.
 Starch, E. A., 829.
 Stark, C. N., 240, 805.
 Starkey, W. F., 460.
 Starr, L. E., 249, 535.
 Starrett, W. C., 535.
 Staten, H. W., 752.
 Staudenmayer, T., 788.
 Stauffer, R. S., 590.
 Stearns, L. A., 71, 732.
 Stedman, A. D., 687.
 Steele, J. G., 736.
 Steenbock, H., 422, 693, 755.
 Steenkamp, J. L., 739.
 Steer, H. B., 341.
 Steffen, E. H., 341.
 Steffens, L. F., 130.
 Stegmann, G., 595.
 Steinbauer, C. E., 39.
 Steinberg, R. A., 21, 60.
 Steiner, G., 70, 489.
 Steiner, H. M., 495.
 Steiner, L. F., 212, 359.
 Steiner, P., 788.
 Steinhaus, E. A., 74, 215, 446.
 Steinmetz, F. H., 629, 772.
 Steinweden, J. B., 645.
 Stellwaag, F., 788.
 Stene, A. E., 621.
 Stephens, J. C., 752, 787.
 Stephenson, R. B., 17.
 Stephenson, R. E., 55, 468.
 Sterges, A. J., 735.
 Stern, K. G., 677.
 Stern, R. M., 455, 663.
 Sterne, M., 101, 523.
 Stevens, D. M., 13.
 Stevens, N. E., 842.
 Stevens, O. A., 477.
 Stevens, R. D., 57.
 Stevens, R. H. W., 751, 759.
 Stevenson, D. D., 478.
 Stevenson, F. J., 64, 181, 349, 605.
 Stevenson, G., 557.
 Stevenson, T. M., 324.
 Steward, F. C., 167.
 Stewart, A., 273.
 Stewart, C. L., 261, 541.
 Stewart, D., 41, 206.
 Stewart, D. F., 247.
 Stewart, M. A., 675.
 Stewart, W. S., 20.
 Steyn, D. G., 101, 329, 523.
 Steyn, H. P., 799, 814.
 Stiebell, H. K., 686.
 Stiemens, B., 772.
 Stier, H. L., 204.
 Stier, T. J. B., 17.
 Stiles, G. W., 525.
 Stitt, L. L., 646.
 Stoa, T. E., 469.
 Stoddard, E. M., 352.
 Stoddard, H. L., 783.
 Stohlman, E. F., 102.
 Stokdyk, E. A., 687.
 Stokes, F. R., 388.
 Stokes, J. L., 739.
 Stokes, W. E., 324.
 Stokstad, E. L. R., 513.
 Stoltenberg, N. L., 588.
 Stone, C. F., 173.
 Stone, E. L., 479.
 Stone, G. M., 627.
 Stone, J. T., 737.
 Stone, R. G., 154.
 Stone, R. W., 517, 745.
 Stone, W. S., 388.
 Storie, R. E., 298.
 Stott, L. H., 575.
 Stout, G. J., 471, 472.
 Stout, G. L., 636.
 Stout, M., 467.
 Stout, P. R., 167.
 Stovall, J. O., 787.
 Stracner, C. L., 358.
 Strandine, E. J., 217.
 Straughn, W. R., 806.
 Strauss, F., 117, 686, 832.
 Strawinski, R. J., 745.
 Streets, R. B., 58.
 Stringfield, G. H., 38, 361, 754.
 Strong, F. C., 354.
 Strong, F. M., 693.
 Strong, L. A., 783.
 Strong, M. T., 30.
 Struble, E. B., 100.
 Stuart, L. S., 726.
 Stuart, N. W., 333.
 Stuart, T. L., 544.
 Stubbs, E. L., 388, 532, 821.
 Stuckey, H. P., 141, 431.
 Studholme, A. T., 495.
 Stuhr, E. T., 675.
 Sturgis, M. B., 178, 182.
 Sturtevant, A. P., 793.
 Stutt, R. A., 261.
 Subbarow, Y., 709.
 Sudds, R. H., 189, 758.
 Sugg, R. S., 226.
 Sugimoto, M., 214.
 Suit, R. F., 66.
 Sukhov, K. S., 203, 646.
 Sukhova, M. N., 203.
 Sullivan, D. T., 142.
 Sullivan, J., 656.
 Sullivan, J. T., 728.
 Sullivan, M. X., 524.
 Sullivan, R. A., 511.
 Sullivan, W., 258.
 Sullivan, W. N., 244, 369, 643.
 Sulman, F., 176.
 Summers, W. A., 106.
 Sumulong, M. D., 90.
 Surtzoff, V., 13.
 Supplee, G. C., 847.
 Sure, B., 420.
 Sutherland, J. A., 28.
 Sutton, G. M., 781.
 Swain, A. F., 647.
 Swales, W. E., 528, 529, 817.
 Swallow, R. L., 373.
 Swaminathan, M., 707, 708.
 Swanson, A. M., 98.
 Swanson, C. O., 269.
 Swanson, G., 492.
 Swanson, P., 557.
 Swanson, W. W., 552.

- Swayne, A. P., 626.
 Sweet, A. T., 156.
 Sweet, R. D., 759.
 Swenson, S. P., 42, 432, 752.
 Swezey, O. H., 858.
 Swift, L. J., 150.
 Swingle, C. F., 19.
 Swingle, D. B., 23.
 Swingle, H. S., 73.
 Swingle, R. U., 629.
 Switzer, R. G., 733.
 Sydenstricker, V. P., 707.
 Sylvester, E. P., 470.
 Symons, J. N., 121.
 Syverton, J. T., 249.
 Szarka, A. J., 175.
 Szařó, I., 31.
 Szendel, A. J., 211.
 Taber, F. W., 782.
 Taborda de Morais, A., 755.
 Tauber, C., 687, 691, 834.
 Tausch, C. F., 687.
 Taft, C. E., 446.
 Taft, L. R., 861.
 Tainsh, P., 280.
 Takahashi, W. N., 58.
 Talbert, T. J., 620.
 Talbot, N. B., 273.
 Tallafarro, L. G., 534.
 Tallafarro, W. H., 523, 534.
 Talley, P. J., 770.
 Talwar, A. S., 217.
 Tamargo, M. A., 755.
 Tang, P. S., 162.
 Tannehill, I. R., 442.
 Tanner, F. W., 455.
 Tanner, L. P., 840.
 Tao, H., 282.
 Tapke, V. F., 61, 629.
 Tarassuk, N. P., 239, 665.
 Tash, L. H., 795.
 Tate, H. D., 205, 361.
 Tate, M. T., 144.
 Taubenhaus, J. J., 770.
 Tauber, O. E., 217.
 Tax, H., 668.
 Taylor, A. L., 489.
 Taylor, A. R., 531, 602, 675.
 Taylor, B. R., 795.
 Taylor, C. C., 4, 687, 688.
 Taylor, C. F., 66, 629, 770.
 Taylor, D., 307.
 Taylor, E. L., 889.
 Taylor, G., 293.
 Taylor, H. C., 257, 401.
 Taylor, J. B., 513.
 Taylor, J. C., 144.
 Taylor, J. S., 805.
 Taylor, L. W., 93, 510, 515, 532, 748.
 Taylor, M. W., 907.
 Taylor, P. R., 110.
 Taylor, R. M., 523.
 Taylor, W. P., 72, 781, 782.
 Taylor-Vinje, M., 780.
 Teban, L. R., 212, 779.
 Telford, H. S., 493.
 Temperton, H., 232, 381.
 Temple, L., 627.
 Templin, E. H., 13, 735.
 Tennant, J. L., 511.
 Teodoro, N. G., 60.
 Tepper, A. E., 532.
 Terrell, W. G., 373.
 Terres, J. K., 366.
 Terry, P. W., 690.
 Tervet, I. W., 345.
 Tersian, L. A., 821.
 Thaden, J. F., 266.
 Thakurta, A. G., 446.
 Thalenhorst, W., 788.
 Tharp, B. C., 446, 454.
 Tharp, M. M., 117.
 Tharp, W. H., 34, 630.
 Thaysen, A. C., 428.
 Theden, H., 34.
 Theophilus, D. R., 372.
 Thibodeaux, B. H., 325, 828.
 Thiel, C. C., 294, 520.
 Thies, W. H., 78, 619.
 Thiessen, E. J., 269.
 Thimann, K. V., 16, 20, 168, 453.
 Thistle, M. W., 380.
 Thom, C., 21.
 Thomas, C. A., 85, 495.
 Thomas, D. S., 288.
 Thomas, F. L., 325, 787.
 Thomas, Harold E., 210.
 Thomas, Harvey E., 59.
 Thomas, H. R., 199, 350.
 Thomas, L. C., 457.
 Thomas, P. T., 454.
 Thomas, R. P., 310.
 Thomas, S. B., 730.
 Thomas, W., 46, 166, 291, 471.
 Thompson, C. P., 795, 802.
 Thompson, D. S., 375.
 Thompson, E. J., 720.
 Thompson, G. E., 769.
 Thompson, H. C., 759.
 Thompson, H. E., 402.
 Thompson, L. S., 720.
 Thompson, N. F., 637.
 Thompson, R. B., 382, 511.
 Thompson, S. Y., 508, 519.
 Thompson, W. C., 511, 805.
 Thompson, W. H., 854.
 Thompson, W. L., 79, 218, 645, 789, 790, 791.
 Thomsen, C. B., 713.
 Thomsen, O., 631, 669.
 Thomson, A. M., 128.
 Thomson, C. A., 4.
 Thomson, D. M., 460.
 Thomson, J. W., Jr., 594.
 Thomson, W., 396.
 Thornber, J. J., 141.
 Thornberry, H. H., 199, 629.
 Thornbrough, A. A., 687.
 Thornton, G. D., 326.
 Thornton, H. G., 168.
 Thornton, M. H., 150.
 Thornton, N. C., 16.
 Thorold, C. A., 486, 501.
 Thorp, F., Jr., 388, 671.
 Thorp, W. T. S., 676.
 Threlkeld, W. L., 818.
 Throckmorton, R. I., 34, 324.
 Thurston, H. W., Jr., 344, 475, 480, 405.
 Thurston, L. M., 98.
 Tiodjens, V. A., 182, 186.
 Tierney, J. L., 112.
 Tiffany, L. H., 445.
 Tigert, J. J., 144.
 Tihomirov, I. K., 441.
 Tilford, P. E., 68, 348, 353, 629, 758.
 Tillson, A. H., 600.
 Tilson, H. G., 329, 332.
 Timberlake, P. H., 504, 793.
 Timonin, M. I., 202, 447.
 Timoshenko, V. P., 117, 542.
 Tincker, M. A. H., 743.
 Tingle, D. C., 466.
 Tingley, M. A., 50.
 Tinkham, E. R., 645.
 Tinney, E. W., 467.
 Tisdale, H. B., 33, 63, 341.
 Tishler, M., 139, 440.
 Tissue, K. A., 855.
 Titus, H. W., 512.
 Tobey, E. R., 694, 740, 798.
 Tobiska, J. W., 300.
 Todd, A. R., 281.
 Todd, F. E., 654.
 Todhunter, E. N., 270, 282, 418, 425, 711.
 Toews, J. L., 819, 372, 399.
 Toit, P. J. du, 372, 373.
 Tolksdorf, S., 30, 318.
 Tolle, C. D., 729.
 Tolley, H. R., 687.
 Tomoi, T., 439.
 Tompkins, C. M., 59.
 Tompsett, S. L., 8, 277.
 Toole, E. H., 329.
 Toole, V. K., 43, 460, 470.
 Topacio, T., 535.
 Topley, W. W. C., 456.
 Topper, Y. J., 566.
 Topping, N. H., 564.
 Torgerson, H. W., 262.
 Torn, E. R., 325.
 Torrance, C. C., 675.
 Torre-Bueno, J. R. de la, 79.
 Torrend, C., 160.
 Torres, R. C., 831.
 Torrsell, R., 321.
 Tóth, L., 728.
 Toumanoff, C., 103.
 Townes, H. K., Jr., 506.
 Townley, R. C., 667.
 Tracy, P. H., 520, 523.
 Trägårdh, I., 789.
 Transeau, E. N., 445.
 Trappmann, W., 58.
 Traun, J., 388.

- Traut, E. F., 850.
 Travis, B. V., 494, 650.
 Treichler, R., 836.
 Trelease, S. F., 593.
 Treloar, A. E., 718.
 Trelogan, H. C., 542.
 Tremblay, G. L., 495.
 Trembley, H. L., 74.
 Tressler, C. J., Jr., 583.
 Tressler, D. K., 135, 547, 566, 841, 847.
 Tressler, W. L., 595.
 Triebold, H. O., 478, 507.
 Tripp, F., 236, 512, 513, 846.
 Trout, G. M., 236, 239.
 Troutman, M. C., 16.
 Troyer, A. F., 358.
 True, R. F., 768.
 Truitt, P. T., 325.
 Trullinger, R. W., 4, 145.
 Trum, B. F., 250.
 Truog, E., 592.
 Trusler, R. B., 496.
 Tucker, C., 880.
 Tucker, E. A., 402.
 Tucker, R. W. E., 219, 670.
 Tukey, H. B., 48, 189, 334.
 Tullis, E. C., 752.
 Tunison, A. V., 781.
 Turk, K. L., 508.
 Turk, R. D., 813.
 Turner, C. N., 467.
 Turner, C. W., 318, 611.
 Turner, E. L., 357.
 Turner, E. M., 632.
 Turner, J. D., 15, 373.
 Turner, R., 687.
 Turrell, F. M., 66, 169.
 Tuthill, C. S., 627.
 Tyler, J., 490.
 Tyler, L. J., 769.
 Tyner, L. E., 61.
 Tysdal, H. M., 324, 465.
 Uber, F. M., 16.
 Ubisch, G. v., 172.
 Udine, E. J., 505.
 Uhler, F. M., 213.
 Ullah, G., 788.
 Ullstrup, A. J., 200, 254, 774.
 Ulliyett, G. C., 81, 792.
 Ulrich, A., 310.
 Ulrich, H. P., 156.
 Umberger, H. J. C., 144.
 Umbreit, W. W., 168, 755.
 Underbjerg, G. K. L., 610.
 Underhill, G. W., 650.
 Underwood, F. L., 258.
 Unna, K., 562, 563.
 Upp, C. W., 95, 106, 226, 510, 532.
 Upshall, W. H., 333, 475.
 Utermohlen, W. P., Jr., 170.
 Uyel, N., 463.
 Uyeno, F., 463.
 Vaile, J. E., 53, 617.
 Valenzuela, A., 90, 522, 808.
 Valle, J. M. D., 858.
 Valteau, W. D., 59, 344, 350, 627, 629, 631, 634, 768.
 Vallega, J., 632.
 Van, J. H. Le, 85.
 Van Arsdell, W. B., 687.
 Vance, A. M., 785.
 Vance, R. B., 119.
 Van Cleave, H. J., 535.
 Vandaveer, R. L., 727, 729.
 Vandecaveye, S. C., 21, 739.
 van der Goot, P., 217.
 Vanderhook, A., 576.
 van der Merwe, P. K., 373.
 van der Plank, J. E., 778.
 Van Dersal, W. R., 490.
 Van Der Vecht, J., 653.
 Vandervilet, B., 540.
 Vanderwalle, R., 345.
 van der Walt, S. J., 101.
 Van Doren, A., 190, 761.
 Van Dyke, H. B., 453, 609.
 Van Ess, M. W., 650.
 Van Etten, C., 800.
 VanLandingham, A. H., 511, 796, 807.
 Van Lanen, J. M., 603.
 Van Leer, B. R., 144.
 van Nispen tot Sevenaer, C. M. O., 256.
 van Overbeek, J., 20.
 Van Roekel, H., 107, 532.
 Vansell, G. H., 653.
 Vanselow, A. P., 352.
 Vanterpool, T. C., 347.
 Van Vlack, C. H., 678.
 Van Voorhis, W. R., 858.
 Van Wagenen, A., 827.
 van Wyk, C. M., 855.
 van Wyk, G. F., 778.
 Vaughn, E. C., 329.
 Vaughn, R. H., 603.
 Veatch, J. O., 156.
 Vegiard, H. E., 470.
 Veihmeyer, F. J., 52.
 Veley, B., 271.
 Velaz, M., Jr., 265.
 Verbrugge, F., 16.
 Verma, G. S., 200.
 Vermillion, H. E., 203.
 Verner, L., 329.
 Verzár, F., 284.
 Vesey-Fitzgerald, D., 791.
 Vestal, C. M., 227.
 Vickery, H. B., 164, 291.
 Vieg, J. A., 267, 268, 834.
 Viégas, A. P., 23, 160, 455, 631, 636.
 Vieira Natividade, J., 601.
 Vigneaud, V. du, 133, 274.
 Vilbrandt, F. C., 295.
 Villagran Prado, F., 602.
 Villiers, E. de, 169.
 Vimtrup, B., 560.
 Vimuktanandana, Y. Y., 485.
 Vincent, C. L., 185.
 Vinje, M. T., 780.
 Vinson, C. G., 77.
 Vinzant, J. P., 357.
 Virgin, W. J., 59, 842.
 Virtanen, A. I., 168.
 Voelker, S. W., 262.
 Vogel, H. A., 687, 829.
 Volk, G. W., 178.
 Volk, N. J., 13, 591.
 Vollmer, H., 567.
 Voorhees, J. M., 271.
 Vorhies, C. T., 72.
 Voris, A. L., 782.
 Waal, H. L. de, 523.
 Wade, B. L., 187, 490.
 Wadleigh, C. H., 34, 630.
 Wadley, F. M., 493.
 Wagner, E. C., 482.
 Wagner, J. R., 660.
 Wahl, H. A., 313.
 Wainess, H., 519.
 Waisman, H. A., 563, 693, 803.
 Waksman, S. A., 156, 157, 291, 455, 524, 603, 604.
 Waldee, E. L., 59.
 Waldo, G. F., 622.
 Waldron, L. R., 204.
 Waletzky, E., 748.
 Walker, B. S., 275.
 Walker, E. A., 66, 486.
 Walker, F. H. A., 238.
 Walker, G. P., 178.
 Walker, H. G., 80, 781.
 Walker, J. C., 186, 484, 628, 757, 769.
 Walker, L. S., 158, 729, 798.
 Walker, P. H., 390.
 Walker, R. H., 432, 579, 859.
 Walker, R. K., 178.
 Walker, W. P., 538.
 Walkey, F. L., 243.
 Wall, L. M., 415.
 Wall, M. E., 449.
 Wall, R., 795.
 Wallace, B. A., 541.
 Wallace, D. B. J., 751.
 Wallace, F. G., 214.
 Wallace, H. A., 859.
 Wallace, L. W., 145.
 Wallace R. H., 11.
 Wallace, T., 777.
 Waller, A. G., 831.
 Waller, E. F., 528, 783.
 Walley, G. S., 371.
 Wallihan, E. F., 298, 766.
 Walliker, C., 693.
 Wallis, G. C., 385, 806.
 Wallrabenstein, P. P., 259.
 Waloff, Z. V., 790.
 Walsh, R. M., 543.
 Walster, H. L., 287, 440, 720.
 Walt, S. J. van der, 101.
 Walter, D. H., 537, 682.
 Walter, E. D., 150.
 Walter, E. V., 80, 212.

- Walter, H., 710.
 Walter, J. C., 629.
 Walter, J. M., 342, 629, 639.
 Walter, W. G., 152.
 Walton, A. C., 214.
 Walton, M. M., 785.
 Walton, W. R., 366.
 Wander, I. W., 50.
 Ward, A. L., 325.
 Ward, K. M., 367.
 Ward, M. V., 427.
 Ward, N. M., 40.
 Warden, C. J., 492.
 Wardlaw, C. W., 764.
 Wardlaw, H. S. H., 548.
 Ware, J. O., 177, 746.
 Ware, L. M., 33, 178.
 Waring, E. B., 548.
 Warrington, K., 745.
 Warkany, J., 461.
 Warner, E. D., 568.
 Warner, G. C., 752.
 Warner, L. H., 492.
 Warner, W. L., 687.
 Warren, D. C., 29, 511.
 Warren, J., 286.
 Warren, S. W., 827.
 Warwick, B. L., 813, 856.
 Watanabe, Y., 671.
 Waterman, A. M., 637.
 Waters, N. F., 389, 511.
 Waters, P. C., 103.
 Waterston, J. M., 200.
 Watkins, J. M., 36.
 Watkins, J. V., 624.
 Watkins, T. C., 74, 786.
 Watkins, W. G., 653.
 Watkins, W. I., 735.
 Watson, A. J., 199, 768.
 Watson, H. M. S., 238.
 Watson, I., 374.
 Watson, J., 795, 818.
 Watson, J. R., 78, 217, 363, 495, 646.
 Watson, M. A., 65, 365.
 Watson, W., 399.
 Watt, J., 525.
 Watts, B. M., 839.
 Watts, P. S., 818.
 Watts, R. L., 495.
 Watts, V. M., 617.
 Waugh, D. B., 697.
 Waugh, F. V., 542, 687.
 Waugh, J. G., 620, 621.
 Waugh, L. M., 554, 555, 697.
 Wayne, J., 693.
 Weakley, C. E., Jr., 796, 807.
 Weakly, H. E., 296.
 Wean, R. E., 478.
 Weaver, J. E., 180.
 Webb, B. H., 811.
 Webb, D. T., 738.
 Webb, L. W., Jr., 306.
 Webb, R. W., 325.
 Webber, H. J., 335.
 Webber, J. M., 601.
 Weber, D., 186.
 Weber, H., 788.
 Webster, J. E., 757, 786.
 Webster, R. L., 363, 649.
 Weddel, K. G., 663, 665, 666.
 Weddell, D. J., 56.
 Weddle, C., 765.
 Weed, A., 496.
 Weetman, L. M., 630.
 Wegener, K., 734.
 Wegner, M. I., 662, 663, 807.
 Wehr, E. E., 399.
 Wehrle, W., 454.
 Wehrwein, G. S., 682, 829.
 Weibel, R. O., 754.
 Weichert, C. K., 818.
 Weidenhammer, L. E., 572, 573.
 Weihe, H. D., 7.
 Weihing, R. M., 324, 466.
 Weimer, D. E., 470, 481.
 Weinberger, J. H., 475.
 Weindling, R., 342, 484, 629, 774.
 Weimann, H., 308.
 Weir, J. A., 800.
 Weis, A., 510.
 Weiser, H. H., 238.
 Weisner, E. S., 389.
 Weiss, F., 50, 67, 199, 342, 630, 768.
 Weiss, G. S., 429.
 Weiss, H., 188.
 Weiss, H. B., 215.
 Welch, D. S., 488, 769, 779.
 Welch, F. J., 288.
 Welch, H., 373, 527, 670.
 Wellborn, V., 201, 210, 778.
 Weller, D. M., 615.
 Wellhausen, E. J., 754.
 Wellington, R., 190.
 Wellman, F. L., 777.
 Wellman, R. H., 628, 629.
 Wells, J. G., 656.
 Wells, L., 139.
 Wells, L. J., 174, 315.
 Wells, O. V., 687.
 Wells, R. W., 403.
 Wells, W., 372.
 Wells, W. H., 356.
 Welsh, M., 388.
 Welton, F. A., 323.
 Wender, S. H., 725, 770.
 Wenger, O. E., 220.
 Wenstrom, W. H., 10, 585.
 Went, F. W., 16, 741.
 Werkman, C. H., 170, 455.
 Werner, H. O., 326.
 Werner, J. J., 482.
 Wernham, C. C., 464, 629.
 Wernimont, K., 405.
 Wertheimer, E., 136.
 Wessels, P. H., 751, 759.
 West, H. O., 39, 545.
 West, J. L., 106, 535.
 West, P. M., 202, 302, 742.
 West, R. A., Jr., 169.
 Western, J. H., 632.
 Westfall, B. B., 102.
 Westman, A., 461.
 Westover, H. L., 35, 324.
 Westover, K. C., 754, 758.
 Westphal, U., 459.
 Wetmore, A., 492.
 Wetmore, P. W., 532.
 Weetolsen, H., 321.
 Wharton, M. F., 45.
 Wheatley, O. J., 861.
 Wheeler, J. T., 231.
 Wheeler, K. E., 135, 765.
 Wheeler, L. A., 686, 687.
 Wheeler, W. A., 469.
 Whelden, R. M., 811.
 Whetstone, E. R., 14.
 Whetzel, H. H., 311.
 Whisler, B. A., 22.
 Whistler, R. L., 181, 451.
 Whitacre, J., 836.
 Whitacre, W. R., 464, 471, 537.
 Whitcomb, W. D., 78, 500.
 Whitcomb, W. O., 470, 612.
 White, A. H., 311.
 White, B. B., 249.
 White, C. J., 548.
 White, E. C., 23.
 White, E. H., 144.
 White, G. C., 246.
 White, H. E., 476.
 White, J. W., 150, 442, 464.
 White, P., 519.
 White, R. T., 503.
 White, W. E., 379, 380, 661.
 White, W. L., 311.
 White, Z. W., 478.
 Whitehead, F. E., 368, 786.
 Whitehead, H. R., 520.
 Whitehead, M. R., 452.
 Whiteman, T. M., 339.
 White-Stevens, R. H., 751, 759.
 Whiting, A. R., 224.
 Whiting, G. C., 453.
 Whitlock, J. H., 529.
 Whitman, W., 463.
 Whitney, R. C., 576.
 Whitson, D., 227.
 Whitten, L. K., 248.
 Whitten, R. B., 75.
 Whyte, R. O., 329.
 Wiancko, A. T., 178.
 Wiant, J. S., 44, 189, 629, 769.
 Wichmann, H. J., 730.
 Wickard, C. R., 2.
 Wickware, A. B., 244.
 Widdowson, E. M., 123.
 Wiebe, G. A., 618.
 Wiehl, D. G., 842.
 Wiener, W. T. G., 469.
 Wienke, L., 741.
 Wiggins, R. G., 751, 755.
 Wight, A. E., 104, 671.
 Wightman, E. T., 748, 796.
 Wiklander, L., 155, 588, 738.
 Wilbur, D. A., 498.

- Wilbur, J. W., 228, 234, 235.
 Wilcke, H. L., 660, 803.
 Wilcox, L. V., 449.
 Wilcox, R. B., 635.
 Wilcox, R. H., 116.
 Wilcox, W. W., 681.
 Wilcoxon, F., 202, 628.
 Wilde, E. I., 471.
 Wilde, S. A., 479, 766.
 Wilder, R. M., 716.
 Wildman, J. D., 521, 727, 728.
 Wileman, R. H., 254.
 Wiley, J. R., 227.
 Wiley, W. H., 655.
 Wilford, B. H., 222.
 Wilford, E. J., 376.
 Wilgus, H. S., Jr., 510, 511.
 Wilhelm, L. A., 96, 516, 661.
 Wilhelmi, R. W., 245.
 Wilkinson, H., 280.
 Willard, A. C., 144.
 Willard, J. T., 858.
 Wille, J. E., 219.
 Willett, E. L., 610, 747.
 Williams, B. O., 688.
 Williams, C. B., 328.
 Williams, C. F., 621.
 Williams, C. L., 361.
 Williams, D. E., 506, 657.
 Williams, G. R., 824.
 Williams, J. K., 372, 398.
 Williams, K. T., 14, 820.
 Williams, L. F., 816.
 Williams, L. H., 428.
 Williams, N. K., 610.
 Williams, P. C., 30.
 Williams, R. J., 22, 233, 506.
 Williams, R. M., 612, 655, 691.
 Williams, S., 325.
 Williams, W. O., 193.
 Williams, W. W., Jr., 637.
 Williamson, C. E., 769.
 Williamson, P. S., 827.
 Willis, E. R., 505.
 Willis, C. O., 583.
 Willman, J. P., 396, 747, 795, 813.
 Willmann, A. W., 805.
 Wilson, F. S., 612, 655.
 Willstaedt, H., 150.
 Wildon, A. J., 247.
 Wilson, B. D., 142, 735.
 Wilson, C. C., 362.
 Wilson, C. V., 748, 796.
 Wilson, H. E., 82.
 Wilson, H. F., 79, 224.
 Wilson, H. L., 811.
 Wilson, I. C., 121, 688.
 Wilson, J. B., 582, 729.
 Wilson, J. D., 347.
 Wilson, J. G., 749.
 Wilson, J. K., 168, 589, 751.
 Wilson, J. W., 228, 795.
 Wilson, L., 587.
 Wilson, L. R., 595.
 Wilson, M., 139, 140, 632.
 Wilson, M. L., 3, 148, 687, 688.
 Wilson, P. W., 17, 168, 455, 582, 742.
 Wilson, R. C., 348.
 Wilson, R. H., 843.
 Wilson, W. E., 705.
 Wilson, W. K., 509.
 Wilson, W. O., 510, 511, 802.
 Wilster, G. H., 387, 522.
 Winburn, T. F., 643.
 Winchester, C. F., 94.
 Winegar, A. H., 799.
 Wing, D. C., 687.
 Wing, L., 218.
 Wingard, S. A., 628, 629.
 Wingert, J. B., 194.
 Wingo, C. W., 359.
 Winkelmann, A., 58.
 Winklepleck, R. L., 192.
 Winkler, A. J., 193.
 Winkler, C. A., 379, 380.
 Winkler, W. O., 729.
 Winn, H. H., 667.
 Winn, L. J., 139.
 Winston, E., 834.
 Winston, J. R., 476.
 Winter, A. G., 773.
 Winter, A. R., 755.
 Winter, H. F., 486.
 Winterberg, S. H., 303.
 Winton, B., 511.
 Wirt, F. A., 183.
 Wirth, C. L., 829.
 Wirth, J. C., 23.
 Wise, G. H., 226, 385.
 Wisnicky, W., 213, 246, 669.
 With, T. K., 150, 279.
 Withrow, R. B., 185.
 Witschl, E., 315, 459.
 Wittenborn, J. R., 567.
 Wittenkamp, R., 479.
 Witter, J. F., 532.
 Woelffer, E. A., 236.
 Woelffer, E. W., 240.
 Woessner, W. W., 666.
 Woke, P. A., 792.
 Wolberg, F. B., 862.
 Wolf, B., 303.
 Wolf, F. A., 638.
 Wolf, M., 16.
 Wolfe, A. C., 726.
 Wolfe, H. S., 335, 624.
 Wolfe, J. M., 606.
 Wolfe, W. R., 250.
 Wolfenbarger, D. O., 504.
 Wolfson, F., 253.
 Wolman, W., 583.
 Wonder, D. H., 316.
 Wong, C. Y., 617, 623.
 Wong, K. K. L., 551.
 Woo, T. T., 701.
 Wood, A. J., 806.
 Wood, F. W., 388.
 Wood, H. G., 170, 455.
 Wood, J. F., 752, 757.
 Woodbridge, M. E., 469.
 Woodburn, R., 442.
 Woodbury, G. W., 329, 399.
 Woodin, M. D., 827.
 Woodman, H. E., 229.
 Woodroof, J. G., 6.
 Woodruff, H. B., 524.
 Woodruff, S., 415.
 Woods, E., 372, 412.
 Woods, F. W., 580.
 Woods, G. M., 388, 530.
 Woods, M. W., 59, 629.
 Woodside, A. M., 781.
 Woodside, M. R., 808.
 Woodward, R. B., 576.
 Woodward, R. W., 466.
 Woodworth, C. W., 431.
 Woodworth, H. C., 260, 405.
 Woofter, T. J., Jr., 834.
 Woolbert, R. L., 692.
 Wooley, J. C., 407.
 Woolley, D. W., 700.
 Woolsey, C., 401.
 Worcester, J., 273.
 Word, O. C., 823.
 Worden, E. C., 143.
 Work, C. E., 281, 583.
 Working, E. J., 681.
 Working, H., 117, 542, 543.
 Works, G. A., 121.
 Wormald, H., 201, 635.
 Wort, D. J., 469.
 Worthen, E. L., 795.
 Worthley, H. N., 495, 496, 648.
 Wortis, H., 705.
 Worzella, W. W., 178.
 Wright, A. W., 606.
 Wright, E., 769, 779.
 Wright, K. T., 831.
 Wright, M. M., 233.
 Wright, R. C., 339.
 Wright, R. E., 752.
 Wright, T., 795, 813.
 Wright, T., Jr., 373.
 Wright, V., 200.
 Wright, W. H., 393.
 Wulf, O. R., 730.
 Wyatt, W. R., 848.
 Wyche, R. H., 752, 757.
 Wyckoff, R. W. G., 388.
 Wyk, C. M. van, 855.
 Wyk, G. F. van, 773.
 Wylie, W. D., 786.
 Yale, M. W., 99, 668.
 Yang, E. F., 703.
 Yap, F., 489.
 Yap, K. S., 728.
 Yarbrough, M., 423.
 Yarnell, S. H., 191, 757, 836.
 Yarwood, C. E., 59.
 Yates, P. L., 411.
 Yeager, A. F., 183, 474.
 Yeatman, F. W., 271.
 Yerkes, G. E., 476.
 Yiengst, M. J., 602.

- | | | |
|-----------------------------|-------------------------|-----------------------------|
| Yoder, B. E., 576. | Youngstrom, C. O., 402. | Zernoff, V., 215. |
| York, H. A., 34, 319. | Younkin, S. G., 769. | Zialcita, L. P., 229. |
| York, H. H., 629. | Yu, T. F., 711. | Ziegler, E. R., 715. |
| Yoshida, R. K., 158 | Yung, F. D., 386. | Ziegler, P. T., 506, 507. |
| Yost, H. E., 769. | Yuska, H., 699. | Zillig, H., 58. |
| Yothers, M. A., 361, 617 | Yutuc, L. M., 526. | Zimmerley, H. H., 178. |
| Young, F. C., 697. | Zachariah, A. T., 200. | Zimmerman, E. C., 505. |
| Young, F. G., 30 | Zaikowski, L., 584. | Zimmerman, H. J., 257. |
| Young, F. N., 73 | Zakharova, E. I., 599. | Zimmerman, H. M., 704. |
| Young, G. Y., 478. | Zalesky, M., 315. | Zimmerman, P. W., 17. |
| Young, H. C., 491. | Zaumeyer, W. J., 629 | Zimmerman, W. I., 143, 847. |
| Young, J. O., 28 | Zazhurilo, V. K., 203. | Zirkle, C., 453. |
| Young, K., 119. | Zeldis, L. J., 750. | ZoBell, C. E., 170. |
| Young, M. T., 371, 491 | Zeleny, L., 720. | Zondek, B., 176. |
| Young, P. A., 325, 351, 490 | Zelle, M. R., 432. | Zopf, L. C., 596. |
| 629, 752, 757, 770. | Zeller, J. H., 172. | Zschelle, F. P., 150, 227. |
| Young, P. T., 567. | Zeller, S. M., 59, 342. | Zundel, G. L., 769. |
| Young, S. M., 725. | Zemlansky, J., 628. | Zurett, S., 244. |
| Young, V. H., 630. | | Zworykin, V. K., 18. |
| Young, W. C., 749. | | |

INDEX OF SUBJECTS

NOTE.—The abbreviations "Ala.", "Conn.[New Haven]", "Mass.", etc., after entries refer to the publications of the respective State experiment stations; "Hawaii" and "P.R." to those of the experiment stations in Hawaii and Puerto Rico; "Can." to those of the experiment stations in Canada; and "U.S.D.A." to those of this Department.

Abacá—

- bacterial wilt, 60.
- mosaic, studies, 60.
- wilt disease, 204.

Abortion—see also Bang's disease and *Brucella abortus*.

- in sheep associated with recovery of *Listeria* from aborted fetuses, 672.
- vibronic, in Michigan sheep, 528.

Acanthoscelides obtectus, see Bean weevil.

Acanthocephala of wild ducks, 535.

Accounting, farm, see Farm.

Acetillo seed weevil, U.S.D.A. 784.

Acer saccharophorum, history of nomenclature of, 159.

Acetate rayon fibers, chemical identification, 717.

Acetonemia in dairy cattle, 388.

Acetylsalicylic acid, effect on ascorbic acid excretion, 427.

Achromotrichin, nutritional, factor curative of, 709.

Acid-base balance, diurnal variations in, 698.

Acids—

- amino, see Amino acids.
- fatty, see Fatty acids.

Acrasieae, communal nature of fruiting process in, 160.

Acriflavine, studies, Idaho 389.

Acrobasis caryae, see Pecan nut casebearer.

Acrobasis juglandis, see Pecan leaf casebearer.

Acroboloides enoplus n. sp., on potatoes, 70.

Acrodynia, cure of in young rats, 422.

Acrothecium lunatum—

- on *Pennisetum typhoideum*, 200.
- spores, 200.

Actinomyces—

- action against disease-producing bacteria, 525.
- sp., wide-range H-ion indicator produced by, 455.

Actinomycetes—

- morphology and physiology, 342.
- role, in soil, N.J. 735.

Actinomycosis, treatment, use of sodium iodide injections in, Ark. 101.

Acuaris hamulosa, arthropod intermediate hosts of, 533.

Adelges abietis, see Spruce gall aphid, eastern.

Adelphocoris rapidus, see Plant bug, rapid.

Adonia variegata predating on aphids, bio-nomics, 223.

Adrenal(s)—

- cortex and carbohydrate metabolism, 697.
- glands, pantothenic acid requirement, Wis. 693.
- ox, isolation of oestrone from, 29.

Adrenalin tablets, subcutaneous implantation, effect on blood sugar and milk composition in lactating ruminants, 238.

Aedes aegypti, see Yellow-fever mosquito.

Aeolopus tamulus, intermediate host of gizzard worm, 533.

Aeolus dorsalis in Florida Everglades, 223.

Aeolus mellillus, life history, 357.

Aerobacter aerogenes, cell-free juices, formation of acetylmethylcarbinol by, 455.

Agar, tryptone-glucose-extract-milk, symposium on, 809.

Agrarian—

- jurisprudence of Italian Court of Cassation, 256.
- law in Italy, 256.
- legislation and new civil code in Rumania, 256.

Agricultural—

- adjustment, 256.
- adjustment, acreage allotments, marketing quotas, and commodity loans, U.S.D.A. 687.
- adjustment projects, objectives and procedures, Tex. 828.
- hyproducts, utilization, Idaho 293.
- census, sample, suggestions for, in West, 255.
- colleges—see also specific colleges.
 - social science courses required by, Tenn. 268.
- colonization, Jewish, in Palestine, 691.
- conservation in Okfuskee County, Okla. 681.
- conservation program, experimental, in Licking County, Ohio, 260.
- control measures, wartime, U.S.D.A. 250.
- credit, Ark. 111, U.S.D.A. 687.
- credit and farm mortgage indebtedness in State, Utah 828.

Agricultural—Continued.

- economic personnel, training and recruitment, 255.
- education, Pa. 545.
- engineering, *see* Engineering.
- experiment stations, *see* Experiment station(s).
- experimental designs, practical difficulties met in use of, 858.
- exports, methods of increasing, U.S.D.A. 687.
- finance in United States, 262.
- fires and dust explosions, U.S.D.A. 823.
- history, American, chronology of, U.S.D.A. 687.
- journals, new, 862.
- labor—
 - and tenancy, 256.
 - British program for, 681.
 - households, professional migratory, 119.
 - in era of change, U.S.D.A. 687.
 - income on farms in Centre County, Pa. 537.
 - problems of unemployment and poverty, 110.
- laborers, renters, share croppers, and day hands, trends in social and economic conditions, 401.
- laborers, tenants, croppers, and day laborers, policies for raising status, 401.
- law, papers on, 256.
- leases, Dutch law on, 256.
- machinery—*see also* Combines.
 - costs of, Ind. 256.
 - for soybean growers, 183.
 - notes, U.S.D.A. 823.
 - repairing, treatise, 109.
- Marketing Service, report of chief, U.S.D.A. 685.
- organization, old and new in, U.S.D.A. 687.
- outlook for 1941, Okla. 681.
- planning, county, and democratic teleists, 681.
- policy and science, U.S.D.A. 687.
- policy, essentials of, U.S.D.A. 687.
- policy since end of World War, U.S.D.A. 686.
- policies and programs, immediate backgrounds, 401.
- press, American, 858.
- problem of today, U.S.D.A. 687.
- problems, American, cultural setting, U.S.D.A. 687.
- production—
 - and trade, U.S.D.A. 256.
 - effect of technical progress on, U.S.D.A. 687.
 - marketing, consumption and trade, and wartime prospects, U.S.D.A. 256.
- products—
 - and byproducts for industrial use, U.S.D.A. 584.
 - cost of production, *see specific crops*.

Agricultural—Continued.

- products—continued.
 - government grading and marketing, value, 835.
 - indexes of prices, purchasing power, etc., Okla. 681.
 - industrial market for, U.S.D.A. 687.
 - marketing, *see* Marketing.
 - production and prices, La. 409.
 - production, changes in methods affecting labor organization, 401.
 - quality, reliability of retail prices as guides to, 110.
 - standardization and inspection, U.S.D.A. 687.
 - transportation by commercial truckers, Ind. 263.
 - use in California, 269, 547.
 - programs, governmental, role of land-grant colleges in, 267.
 - programs, governmental, working relations in, 834.
 - research—*see also* Research.
 - and a North Dakota live-at-home program, N.Dak. 287.
 - resources in western Box Elder County, Utah 828.
 - situation, Okla. 402.
 - statistics, U.S.D.A. 686.
 - surpluses and nutritional deficits, U.S.D.A. 686.
 - surpluses, wartime, of Danube Basin, U.S.D.A. 686.
 - tenancy, *see* Farm tenancy, Farm tenure, Land tenancy, and Land tenure.
 - workers, accessions in working and ownership of land, 110.
 - workers, migratory, earnings, income per family, educational attainment of children, and possibilities of adjustments, Ark. 681.
- Agriculture—
- American, and European war, U.S.D.A. 686.
 - American, first 300 years, U.S.D.A. 686.
 - and social insurance, 515.
 - and the war in Netherlands, U.S.D.A. 256.
 - and the war in Sweden, U.S.D.A. 410.
 - at Philadelphia meetings of A.A.A.S., editorial, 289.
 - Belgian, rural cooperation in, treatise, 262.
 - Department of, *see* United States Department of Agriculture.
 - electricity in, *see* Electricity.
 - Federal-State relationships in, 268.
 - in countries of western Europe, 411.
 - in primitive cultures, bibliography, U.S.D.A. 544.
 - in Russia, financing, 256.
 - in World War period, U.S.D.A. 686.
 - inter-American relations in, U.S.D.A. 686.
 - Italian, under Fascism and war, U.S.D.A. 540.

Agriculture—Continued.

- meaning of foreign trade for, U.S.D.A. 687.
- metallic salts and alkaloids in, Mich. 215.
- of Netherlands Indies, U.S.D.A. 256.
- of Utah, trends in, Utah 828.
- of Worcestershire, history and rural evolution, 410.
- relation to war and national defense, U.S.D.A. 827.
- southern, human relations in changing conditions, 266.
- southern, suitable crop patterns for changing conditions in, 178.
- transportation problem of, U.S.D.A. 687
- tropical, bibliography, 718.

Agrius ansius, see Birch borer, bronzed.

Agrotis mancus, see Wireworm, wheat.

Agromyza—

- caerulea*, infesting sweetpotato seed in Puerto Rico, 74.
- obtus*a parasite, life history and morphology, 225.

Agronomists and entomologists, cooperation in plant breeding studies, 358.

Agropyron smithii, germination studies, 470

Ahasverus advena, notes, Mont. 785.

Air—see also Atmosphere.

- and its mysteries, treatise, 158.

Airplane—

- disinsectization of, 361.
- spore traps for study of wheat rust migration, 483.

Alabama argillacea, see Cotton leaf worm.

Alabama Station, report, 141.

Alaska College, notes, 719.

Alaska Station, notes, 719.

Albumin, egg—

- high and low percentage of thickness, breeding for, 314.
- inheritance of quality, 748.
- injury, relation to biotin deficiency in ducks, 283.
- injury, vitamin H as curative factor, 284.
- quality, relation to humidity of storage, N.J. 704.

Albuminuria in dairy cows, field test for, 671

Alcohol—

- power, from farm products, Iowa 678.
- vitamin A, preparation from rich fish-liver oils, 438.

Aleurites fordii, treatment with vitamin B₁, P.R. 618.

Aleyrodidae genera and subgenera, list, 500.

Alfalfa—

- aphid, U.S.D.A. 784.
- as aid in reducing wireworm populations, Idaho 357.
- as sole source of protein in dairy rations, Utah 807.
- bacterial wilt, control, U.S.D.A. 633.
- bacterial wilt resistant strains, selection and propagation, Utah 771.
- bacterial wilt-resistant varieties, development, U.S.D.A. 751.

Alfalfa—Continued.

- breeding, Ariz. 33, Colo. 612, N.J. 751, R.I. 34, S.Dak. 752, Utah 753.
- breeding in Sweden, 321.
- carotene content, U.S.D.A. 662.
- catcrpillar, biology and control, 647, La. 357.
- culture experiments, Ariz. 33, Mont. 612, Tex. 753.
- diseases in Mexico, U.S.D.A. 769.
- effect of nurse crops with, Idaho 319.
- fertilizer experiments, Ariz. 33, Idaho 319, N.J. 751, Okla. 752, Tex. 753.
- hay, artificially dried, vitamin A potency, 235.
- hay cut at three stages of maturity, effect on milk production, U.S.D.A. 807.
- hay, digestibility by bovines, 388.
- hay, hemicelluloses of, 7.
- hay phosphorus, availability to white rats, 657.
- hay, undercured, thermal decomposition, relation to spontaneous ignition, 728.
- hay v. mixed hay and grass silage for dairy cattle, Wash. 383.
- hopper, three-cornered, biology and control, La. 358.
- Improvement Conferences, reports, 324.
- insects, Utah 787.
- irrigation tests, Tex. 753
- Ladak, test, Mont. 612.
- leaf meal as substitute for wheat by-products in broiler rations, Ind. 227.
- leaf meal, effect of differing mash levels in enhancing hatchability, R.I. 95.
- looper, Mont. 786.
- measurement of winter growth for grazing value, Ariz. 33.
- mosaic virus, comparative host ranges, 344.
- red clover, and sweetclover as hay crops, comparison, Ind. 178.
- response to boron, effect of soil conditions, 180.
- response to fertilizers and lime, W.Va. 754.
- response to phosphorus deficiency on certain soils, W.Va. 754.
- rhizosphere of, microbial population in, 447.
- seed production, relation to *Lygus* spp., U.S.D.A. 646.
- seed setting, 465, Ariz. 33.
- seed viability in, farm demonstrations as measure, 470.
- silage, see Silage.
- snout beetle, studies, 86, 871, [N.Y.] Cornell 786.
- stem blight, relation to *Phytophthora medicaginis* and *Ascochyta* sp., Utah 771.
- stubble, seeding of pasture mixtures in, Utah 753.
- symbiotic nitrogen fixation by, relation to bacteriophage of *Rhizobium* fn, 21.
- uses, U.S.D.A. 35.

Alfalfa—Continued.

- varieties varying in susceptibility to wilt, relative nodulation of, 204.
- variety tests, Ariz. 33, Idaho 319, Mont. 612, N.J. 751, Okla. 752, Pa. 464, Tex. 752, Utah 753.
- weevil, 788, Mont. 786, U.S.D.A. 784.
- weevil, larval parasite of, 653.
- weevil, spread, U.S.D.A. 785.
- weevil survey, U.S.D.A. 785

Algae—

- blue-green, poisonous to livestock, Colo. 668.
- green, pigments produced in darkness by, 743.
- mixotrophic, relation between vitamin requirements and loss of synthesizing capacity, 742.
- of Oklahoma, additions to, 446.
- relation to nitrogen economy of soil, 739.
- sexual substances in, 453.
- thermal, chlorophylls and photosynthesis of, 165.

Alimentation, mystery of, 549.

Alkali—

- disease of horses, experimental studies, 820.
- land reclamation, Idaho 298, 825.
- poisoning, 523.
- soils, pH determination, 582.

Alkaline soils, acidification, 338.

Alum—

- species, pungency, effect of variety and ecological conditions, [N.Y.]Cornell 759.
- vegetable species, smut resistance in, 627.

Almond(s)—

- bud shattering, 480.
- composition of shell, 727.
- leaf and flower buds, marked histogenic differences in, Calif. 454.

Aloe vera leaves in treatment of burns, P.R. 618.

Alpine rock crawler, Mont. 786.

Alpine media seed germination, 469.

Alternaria—

- spp. on cotton seedlings and bolls, 774.
- stem canker of *Antirrhinum*, notes, U.S.D.A. 342.

Alyceclover—

- adaptation, cultural needs, and uses, U.S.D.A. 324.
- in Florida, cultural and fertilizer requirements, composition, and disorders, 324.

Alysia riddunda, parasite of blowfly, studies, 224.

Amanita muscaria in Uruguay, 160.

Amazon fly—

- dry area race, introduction into Barbados, 650.
- parasite of sugarcane borer in Louisiana, 363.
- promising parasite of sugarcane borer, 494.

Amblyseia coccophaga cause of immature nutfall of coconuts, 791.

Ambrosia beetle(s)—

- studies, U.S.D.A. 784.
- transmits Dutch elm disease, 357.

American—

- Association of Economic Entomologists, Cotton States Branch, history, 494.
- Sociological Society, proposals for reorganization, 688.
- Soybean Association, proceedings, 182, 755.

Amino acids—

- effect of ultraviolet light on, N.Y.State 582.
- in oats, U.S.D.A. 725.
- use by bacteria, enzymes concerned, 603.
- 4-Amino-2-methyl-1-naphthol and 4-amino-3-methyl-1-naphthol, vitamin K activity, 715.
- Ammonia, atmospheric, as primary source of nitrogen to plants, 297.

Ammonium—

- bicarbonate secreted by surgical maggots, healing properties, 524.
- sulfate, production and agricultural use, U.S.D.A. 592.

Amniotin and progesterone combinations, effect on uterine weight of rats and mice, 750.

Amsinckia intermedia nutlets, toxic to swine, horses, and cattle, 101.

Anabasin—

- concentration-mortality curves for solutions toxic to eggs of *Lygaeus kalmii*, 360.
- tests against apple aphids, 364.

Anabrus simplex, see Cricket, Mormon.

Anaerobes, nonsporulating, growth in synthetic media and extracts from corn silk, 169.

Anaerobic infections, experiments with sulfa-pyridine administered against, 102.

Anagyrus—

- coccidiivorus, rearing, liberation and recovery at Lajas, P.R. 640.
- fusciventris, parasite of long-tailed mealybug, 365.

Analytical methods, referees reports, A.O. A.C., 1940, 728.

Anaplasma ovis, transmission to blesbuck, 523.

Anaplasmosis—

- in Antigua, 246.
- ovine, studies, 523.
- relation to flies and mosquitoes, Okla. 786.
- studies, Tex. 813, U.S.D.A. 813.
- transmitted by tipping horns of cattle, 525.

Anarhopus sydneyensis, parasite of long-tailed mealybug, 365.

Anareta lineatella, see Peach twig borer.

Anasa tristis, see Squash bug.

Ancylis fragariae, see Strawberry leaf roller, American.

Androgens—

- endogenous, and liver, 174.
- ovarian, in mice, comparison with synthetic androgens, 30.

Androsterone, relation between volume of vehicle and chick comb response to, 818.

Anemia—

- equine infectious, immunologic reactions associated with, 675.
- hemorrhagic, in dogs, iron and copper v liver in treatment, 276.
- infectious, U.S.D.A. 818.
- nutritional, studies, Miss. 427.
- of pigeons as a deficiency disease, 382.

Anemometer—

- cup, improved design, 586.
- new electronic, 586.

Anesthesia—

- and stimulation, protoplasmic nature of, 744.
- of fur-bearing animals, 213.

Aneurin, *see* Vitamin B₁.

Angiosperms, double fertilization and development of seed, 601.

Angitia cerophaga, notes, 225.

Angleton grass, breeding, Tex. 753.

Angleton grass, planting tests, Tex. 753.

Anguina australis n.sp., description, 70.

Animal(s) — *see also* Cattle, Livestock, Mammals, Sheep, etc.

- and products, imported, inspection and quarantine, U.S.D.A. 813.
- breeding and twins, research on, 456.
- chromosomes, *see* Chromosomes.
- diseases—*see also specific diseases*.

- foreign, continued exclusion, U.S. D.A. 813.

- in Canada, 814.

- laboratory diagnoses, Ind. 243.

- of genito-urinary systems, 668.

- progress in use of prontosils, sulfanilamide and sulfapyridine for, 243.

- studies, U.S.D.A. 813.

- domestic, from Formosa, parasites of, catalog, 214.

- experimental, methods of exposing to virus infection through mosquito vectors, 245.

- farm, breeding, growth, and inheritance, treatise, 794.

- farm, goller in, prevention, Mont. 670.

- fats, *see* Fats.

- feed utilization, differences in individuals, Okla. 747.

fur-bearing—

- anesthesia of, 213.
- reproductive cycle, U.S.D.A. 747.
- tomatoes and tomato products for, 98.

- identification by tattooing, 658.

- infected, individual isolation in single room, 524.

- licks, composition, 873.

Animal(s)—Continued
nutrition—

- function of manganese in, Pa. 507.
- papers on, 506.

- value of grassland products in, 796.

parasites, *see* Parasites.

plagues of North America, history, 524.

production, heredity and environment in, 605.

production of kidney stones on low-phosphorus diet, Wis. 693.

reactions to environmental temperature, humidity, and air movement, 227.

reproductive cycles in, 316.

small, respiration apparatus for serial work with, 782.

tissues, glycogen break-down and synthesis in, 697.

tissues, protein bound ascorbic acid of, 710.

wild, damage to seed and seedlings on cut-over Douglas fir lands, U.S.D.A. 641.

Anisandrus pyri in British Columbia, 505.

Ankothrips—

genus, review, 790.

notabilis n.sp., description, 790.

Annona anthracnose, 636.

Annulus zonatus, transmission from currant to tobacco, 628.

Anomala orientalis, *see* Oriental beetle.

Anopheles, *see* Malaria and Mosquitoes.

Ant(s)—

Argentina, survey and control measures in Victoria, 654.

bait containers, new type, 494.

in golf greens and lawns, control, R.I. 75.

v. codling moth, W.Va. 787.

white, *see* Termites.

Antestia lineaticollis, two egg parasites of, 372.

Anthelmintic, equine, phenothiazine as, 531.

Anthelmintics, comparative tests, 396.

Antlers, excised, cultivation in nutrient solution, 598.

Anthonomus—

grandis, *see* Bollweevil.

grandis thurberiae, *see* Thurberia weevil.

musculus, *see* Cranberry weevil.

Anthracnose, *see specific host plants*.

Anthrax—

immunization of laboratory animals against, 523.

inoculation against, saponin spore vaccine for, 101.

symptomatic, *see* Blackleg.

vaccines prepared from avirulent variants of *Bacillus anthracis*, *see* 523.

Anthrenus—

scrophulariae, *see* Carpet beetle.

vorax, new parasite of, 372.

Anthropology—

and agriculture, bibliography, U.S.D.A. 544.

cultural, and modern agriculture, U.S.D.A. 687.

Anticarsia gemmatilis, see Velvetbean caterpillar.

Antihemorrhagic—see Vitamin K.

Antineuritic vitamin, see Vitamin B₁.

Antirachitic, see Rickets and Vitamin D.

Antirrhinum, *Alternaria* stem canker, notes, U.S.D.A. 342.

Antiscorbutic, see Vitamin C.

Antuitrin-G, effect on development of hare-lip in strains of mice, 607.

Anuraphis bakeri, see Clover aphid.

Anuraphis rosae, see Apple aphid, rosy.

Anysis agilis, predacious on eggs of artichoke plume moth, 506.

Apanteles—

congregatus, parasite of hornworm, 506.
plutellae, notes, 225.

Aphanomyces root rot reductions by heavy applications of phosphate, U.S.D.A. 768.

Apharyngostrirea bilobata n.sp., from herons, 641.

Aphelenchoides—

coffae n.comb., status, 70.

fragariae on peony and oriental poppy, 70.

Umberti, measurements and morphology, 70.

Aphelinus mali, natural dispersion, 357.

Aphid(s)—

and cucumber beetles, transmission of cucurbit viruses by, comparison, 627.
and their hosts, ether extracts of, avena coleoptile assay, 18.

as vectors of onion yellow dwarf, 364.
cause of deformed snowball bushes, N.Y.State 647.

coccinellid predators of, bionomics, 223.

control, N.Y.State 642.

dwarfing of roses by, 78.

economic, of New York, [N.Y.]Cornell, 786.

effect of insecticides used in bollweevil control, 494.

in South Africa, *Aphidius* parasites of, 81.

in subtropical climate, ecology, 217.

in Virginia apple orchards, 789.

injury in vetch, species and variety differences in resistance, 646.

of coniferous trees, 216.

of genus *Brevicoryne*, table for their separation, 501.

on citrus, 363.

peach-stem, life history, 217.

reproduction, hibernation, and control, Colo. 364.

transmission of cucurbit viruses by, 789.

variation of size within species, 217.

western, studies, 787.

woolly, see Apple aphid, woolly.

Aphidius as parasites of aphids in South Africa, 81.

Aphis gossypii, see Melon aphid.

Aphis idaei, variation of size within species, 217.

Aphis maidis, see Corn leaf aphid.

Aphis pomi, see Apple aphid.

Aphis rumicis, see Bean aphid.

Apiary inspection, Tex. 787.

Apion martinetti, notes, U.S.D.A. 784.

Apoplexy in a canary, 253.

Apparatus—

for applying insecticides, new or recently developed, 353.

for determination of thermal death points of animal parasites, 496.

for drying from frozen state, 602.

for measuring microscopic objects, 602.
grafting-wax melter, construction and operation, U.S.D.A. 758.

micro-climate recorder, description, 296.

ultrafiltration, description, 212.

Apple(s)—

angular leaf spot, 635.

anthracnose in Illinois, U.S.D.A. 630.

anthracnose, northwestern, in Maine, U.S.D.A. 59.

aphid, rosy, vector of narcissus mosaic, 642.

aphid, tests of insecticides against, 364.

aphid, woolly, notes, U.S.D.A. 784.

aphid, woolly, tests of insecticides against, 364.

behavior in storage, factors affecting, [N.Y.]Cornell 761.

biennial bearing, control, N.J. 760.

bitter pit, cause and control, [N.Y.] Cornell 761.

bitter pit, in orchard and in storage, Vi. 777.

bitter pit, relation to boron, 777.

bitter rot in southern Illinois, U.S.D.A. 59.

blossom midge in Japan, 221.

blossoms, set, effect of bactericides and fungicides, [N.Y.]Cornell 761.

blotch control, frame of dormant sprays for, Ind. 200.

boron deficiency, 210, [N.Y.]Cornell 760.

buds, catalase activity and nitrogen in, relation to advance in season, 474.

color and fruit drop, relation to soil management, [N.Y.]Cornell 761.

color development after harvest, 52.

color, effect of N on, U.S.D.A. 756.

color, increasing, sodium thiocyanate sprays as factor, W.Va. 758.

copper injury tests, N.Y.State 630.

corky brown spots in, effect of B in preventing, U.S.D.A. 756.

crab, see Crab apple.

Crimson Beauty, preharvest drop, control by spraying, 333.

cull, for dairy cows, Va. 235.

culture, N.J. 760.

Apple(s)—Continued.

- culture, value of Malling rootstocks in, Pa. 471.
- cuttings, rooting, value of growth substances for, Pa. 471.
- diseases, comparative susceptibility of varieties to, Kans. 333.
- diseases in Ozark section of Arkansas, U.S.D.A. 769.
- distribution in New York City by chain and independent retailers, [N.Y.] Cornell 827.
- drop, retarding, effect of growth-promoting substances, 50, U.S.D.A. 756.
- effect of boron, Mont. 617.
- effect on disappearance of complex carbohydrates from alimentary tracts of children, 551.
- fall fertilized, frost rings in, N.H. 50.
- fertilizer requirements, Vt. 185.
- fruit color and nitrogen in leaves, correlation, 474.
- functional disorders of, 209.
- grafts, inducing rooting from scions, deep planting for, Pa. 471.
- grown in Minnesota, biochemical studies, Minn. 437.
- growth and fruiting, effect of mulch, [N.Y.] Cornell 761.
- growth and nitrogen intake, effect of root temperature, 619.
- growth in sand culture, interaction of nitrogen, potassium, and phosphorus on, 473.
- growth increment, 620.
- harvested, sun-coloring, R.I. 44.
- highly colored, maturity index, U.S.D.A. 756.
- improvement and outstanding seedlings, 760.
- industry of Connecticut, effect of 1938 hurricane, 297.
- insects, control, 73.
- internal cork, and boron deficiency, 66.
- Jonathan, effect of time of nitrogen application on response, 49.
- juice, new outlet for Utah's fruit crops, 547, Utah 123.
- keeping quality, effect of controlled atmospheres, [N.Y.] Cornell 761.
- keeping quality, effect of low but non-freezing temperatures, [N.Y.] Cornell 761.
- leafhopper control, 359.
- leafhopper on rose, 78.
- leafhopper, white, on rose, 78.
- leaves, photosynthesis and transpiration, effect of bordeaux mixture on rate, 210.
- leaves, photosynthesis, effect of mild sulfur sprays, 210.
- leaves, photosynthetic activity, [N.Y.] Cornell 761.
- leaves, structure, chlorophyll content, and photosynthesis in, relation, 189.
- leaves, varietal differences in resistance to early frosts, N.J. 760.

Apple(s)—Continued.

- maggot, adaptability in respect to hosts, 222.
- maggot control, U.S.D.A. 783.
- maggot control, substitutes for lead arsenate for, Conn.[New Haven] 495.
- maggot, effect of methyl bromide on, 357.
- McIntosh, in modified atmosphere cold storage, physiological studies, 190.
- McIntosh, premature dropping, factors in, Mass. 51.
- magnesium deficiency in, 777.
- mechanical injuries to, origin, Ohio 51.
- new promising varieties, for Utah, Utah 620.
- Northern Spy, cork experimentally produced on, 51, 209.
- Northern Spy, effect of prolonged flooding on top growth and nutrient absorption by, [N.Y.] Cornell 761.
- orcharding, economics of, N.H. 405.
- orchards, effect of droughts of the '30's in Kansas, 620.
- orchards infested with mealybug, mold increase in, U.S.D.A. 768.
- packages, need for standardizing, Pa. 471.
- percentages of grades packed in 1938 and of packing costs, W.Va. 828.
- pests, control, development of an effective program for, Vt. 185.
- pollen, longevity, 47.
- pollen value of varieties, 620.
- pollination, experiments designed to limit, 619.
- products, U.S.D.A. 725.
- removal of soot deposits from, W.Va. 758.
- retail demand for, 408.
- Rome Beauty, effect of forms of nitrogen carriers on response to, 49.
- root and soil moisture studies, Conn. [New Haven] 442.
- root systems, soil atmosphere and production of new rootlets by, 48.
- rootstocks, Malling, behavior in soils of varying moisture content, 189.
- rootstocks, studies, Ind. 185, W.Va. 758.
- rust, control with sodium dinitroresylate, 354.
- rust, inheritance of susceptibility and resistance to, 171.
- scab control, 628, 629.
- scab, control by eradican treatments, 68, Ind. 200.
- scab control, development of an effective program for, Vt. 185.
- scab, fungicidal tests for, [N.Y.] Cornell 769.
- scab, notes, 779, R.I. 60, Vt. 200.
- scions, stand and growth, relation to cracking of graft coatings, 189.
- seedlings growing in sand, effect of reaction of nutrient solution, 49.
- seedlings, noninfectious hairy root, root responses under different methods of propagation, 66.

Apple(s)—Continued.

- seeds, afterripening, catalase activity in relation to, 474.
- shriveling in storage, prevention, [N.Y.] Cornell 761.
- soft rot, 779.
- spray injury, 66.
- spraying, Conn.[New Haven] 480, Ind. 185, R.I. 44.
- spraying for blossom removal, 761.
- sprays, deposition and retention, Pa. 496.
- Stayman, blooming date in 1940, N.J. 761.
- stored, effect of CO₂ on ripening, U.S. D.A. 756.
- thinning by spray at blooming, 190.
- tree(s)—

- borax treatments for drought spot and corky core, Idaho 342.
- borer, flatheaded, as rose pest, Tex. 787.
- budded, and seedlings, effect of soil acidity on growth, [N.Y.]Cornell 761.

- productivity, tree girth and yield as indicators, N.H. 474.
- pruned v. unpruned, 620.
- size relation of varieties on clonal rootstocks, 48.
- wood decay in, 351.
- young, growth, effect of sprays, R.I. 44.

- triploid, development, S.Dak. 757.
- use of growth-promoting substances for, U.S.D.A. 756.

- varieties, hardness of scion roots from, 333.
- varieties, new, performance, N.Y.State 190.
- varieties on various rootstocks, growth and production, 48.
- varieties, standard, comparative performance on different rootstocks, 189.
- Wagener, winter growth in vegetative buds, 761.
- waxing, additional effects, 191.
- Winesap, seasonal changes in composition of parts, Ind. 150.

Apricot(s)—

- breeding, Utah 758.
- growth, old and young types, 761.
- improvement and outstanding seedlings, 760.
- pollen, longevity, 47.

Arborvitae Berkman blight, 779.

- Arginine, ability of citrulline to replace, in diet of chick, 94.

Argyria similis n.s.p., description, 221.

Arizona Station, report, 141.

Arkansas Station, notes, 576.

Arkansas Station, report, 718.

Arkansas University, notes, 576.

Armadillo, habits, Tex. 782.

Armillaria—

- in western Washington, 741.
- root rot, relation to soil temperature,

Armyworm—

- beet, as tomato pest, Calif. 792.
- control, U.S.D.A. 366.
- fall, notes, U.S.D.A. 784.
- fall, on corn, control, P.R. 610.
- life history, in Mississippi, 366.
- southern, effect of ingested insecticides on midgut wall, 702.
- studies, Ind. 212, Mont. 786, U.S.D.A. 784.

Aroles amoenus, external morphology, 224.

- Arsenate-arsenite systems, in sand and soil mediums, oxidation-reduction potential, 302.

- Arsenic absorption by plants from soils under natural conditions, 22.

- Arsenic, distribution in soils and its presence in plants, U.S.D.A. 14.

Arsenical substitutes, N.J. 786.

- Artesian basin, land overlaying, tile drainage not advocated for, Utah 678.

Arthritis in swine, 388.

- Arthropoda, unexpected species, found in South Dakota, 499.

- Artichoke plume moth, predacious mite on eggs, 506.

- Artona catowaniha*, parasites and hyperparasites of, 372.

- Asbestos fibers, chemical identification, 717.

- Ascarid infestation in dogs, phenothiazine test in, 398.

Ascaridia—

- donasae* n.s.p., description, 399.

- galli*, efficiency of phenothiazine against, 252, 818.

- lineata* eggs, thermal death points and heat tolerance, 789.

- lineata* in ruffed grouse, 399.

- lineata*, resistance of chickens to, following immunization, 252.

Ascaris—

- columnaris*, parasite of raccoon, 783.

- equorum*, test of phenothiazine against, 581.

- lumbricoides*, anthelmintic activity of crystalline papain, 103.

- lumbricoides*, anthelmintic activity of fresh pineapple juice against, 102, 103.

- swis* eggs, effect of tropical sunlight on, 214.

Asota rapae, see Cabbageworm, imported.

Ascochyta—

- bohémica* on *Campanula*, 200.

- mafalis* on lily of the valley in United States, 628.

- Ascochyta pentstemonis* n.s.p., on *Pentstemon* from California, 772.

Ascomycetes—

- life histories, new data on, 593.

- new species on coniferous hosts, 779.

Ascorbic acid—see also Vitamin C.

- and dehydroascorbic acid in milk, effect of commercial practices, 666.

- availability in food, method for study, 426.

- determination, 151.

- excreted at each urination during twenty-four hour periods, amount, 424.

Ascorbic acid—Continued.

- excretion, effect of drugs on, 427.
- gastrointestinal absorption, in infants, effect of catharsis and diarrhea, 566.
- growth response of plants to, 20.
- in cabbage, effect of variety, season, and soil fertility, 422.
- in foods, Ga. 122.
- in goat's milk and blood, 236.
- in guinea pigs, excretion, absorption, and storage in, 283.
- in Indian gooseberries, 424.
- in lemon juice and in crystalline form, comparison of utilization by guinea pigs, 711.
- in parsnips, 428.
- in quick-frozen food, 694.
- in red raspberries and in crystalline form, comparison of utilization by college women, 425.
- in strawberries, varietal differences, 423.
- in turnip greens, changes during boiling under different conditions, 423.
- in urine, determination, 439.
- metabolism of college students, 424, Utah 711, 886.
- properties, food sources, and stability, 847.
- protein bound form, of animal tissues, 710.
- relation to tobacco mosaic virus, 635.
- requirement to maintain tissue saturation, 425.
- therapy of slow-breeding bulls, directions for, 508.
- values of blood and urine, effect of fever therapy, 137.

Ash trees, response to soil fertility in station frames, Conn.[New Haven] 442.

Asparagine and glutamine in beets and spinach, relative rates of production, R.I. 13.

Asparagus—

- beetle, insecticides for control, N.Y.State 642.
- root development, effect of deep soil treatment, N.J. 758.
- spacing, [N.Y.]Cornell 759.
- tenderometer readings as index of quality, 888.

Asparagus sprengeri, macrosporogenesis and development of female gametophyte, 17.

Aspergillus—

- flavus*, bactericidal filtrates from, 28.
- niger* bombarded by low voltage cathode rays, variant strains induced by, 311.
- niger*, distribution in Germany, 342.
- niger*, yield, sporulation, and starch formation of, action of organic compounds on, 60.
- spp. in soils of Buenos Aires, 445.
- spp., isolated in Montevideo, identification, 160.
- spp., mutations and reversions in reproductive activity with nitrite, colchicine and ϵ -lysine, 21.

Aspidiotus perniciosus, see San Jose scale.

Asporomyces n.sp. on grapes and in grape products in California, 171.

Association of—

- American Feed Control Officials, notes, 143.
- Land-Grant Colleges and Universities—
 - convention, editorial, 1.
 - convention, officers elected, 5, 143.
 - 1940 convention, research at, 145.
- Official Agricultural Chemists, notes, 143.
- Official Seed Analysts, proceedings, 469, 470.

Aster(s)—

- leafhopper, multiplication of aster yellows virus in, 778.
- leafhopper, vector of California aster yellows from potato to aster, 485.
- requirements for soilless culture, Ohio, 765.
- seeds, tests, N.Y.State 624.
- yellows, California, infecting potatoes, 485.
- yellows, cure, by heat treatments, 628.
- yellows virus, multiplication in aster leafhopper, 778.

Asteraceae, Arizona, new species and new names among, 447.

Asterolecanium—

- spp., *Kearfottia* n.sp. on, P.R. 640.
- spp., on bamboo, biological control, P.R. 640.
- variosum*, anatomy, biology, and effect on host trees, 647.

Astragalus, physiological differentiation, in response to selenium, 593.

Athalia colubri, notes, 788.

Atmosphere—see also Air.

- stability in, isentropic layer data to determine, 585.

Atmospheric moisture, see Humidity.

Attagenus piceus, see Carpet beetle, black.

Auctions—

- community, for marketing agricultural products, Md. 407.
- country fruit and vegetable, in eastern seaboard States, [N.Y.]Cornell 407.
- country, marketing for fruit and vegetables, U.S.D.A. 833.
- vegetable, small-lot country, operation, U.S.D.A. 832.

Autographa brassicae, see Cabbage looper.

Autographa californica, see Alfalfa looper.

Autoserica castanea, see Garden beetle, Asiatic.

Auxin—

- content of ovaries at different stages of development, 16.
- effect on meristem types in *Brassica*, 453.
- enzymatic liberation from plant tissues, 20.
- high concentration, effect on growth and geotropism of wheat coleoptile, 445.
- in marine plants, 20.
- mobile, in bean seedlings, effect of naphthalene acetic acid on, 20.
- seed treatment, aftereffects of, 162.
- Auxiphyle from peas, physiological effects in animals, 749.

- Avian pest virus, cultivation in embryos of chicken, duck, and turkey, 676.
- Avitaminosis—*see also* Vitamin deficiency.
K, alimentary, in rats, 139.
- Avocado(s)—
fertiliser experiments, 385.
seedlings, rootlet rot, 60.
- Azalea flower-spot disease, U.S.D.A. 67.
- Azalea, shoot growth and flower-bud set in, 196, [N.Y.]Cornell 765.
- Asotobacter*—
distribution and activity in Arizona soils, Ariz. 13.
studies, Colo. 589.
vinelandii, first discovery in Colorado soils, Colo. 589.
- Azya trinitatis*—
establishment as scale predator, P.R. 640.
shipment to Florida and Hawaii for liberation against coconut scale, P.R. 640.
- Babecock test, accuracy, factors affecting, Vt. 235.
- Baby beef, *see* Cattle, baby beef.
- Bacilli, aerobic spore-forming, taxonomy, physiology, and morphology, [N.Y.]Cornell 806.
- Bacillus*—
abortus, *see* *Brucella abortus*.
albolactis, contamination of high grade pasteurized milk with, 665.
anthracis, notes, 523.
genus, taxonomy, modes of spore germination, 169.
larvae, relation of proteolytic enzymes to phase of life cycle of, 793.
lentimorbus n.sp., description, 503.
mesentericus, variation in *Helminthosporium sativum* induced by toxic substance from, 490.
popilliae n.sp., description, 503.
species, phytopathogenic, redistribution, 59.
subtilis in milk, heat resistance, factors affecting, 808.
- Bacon—
Canadian Wiltshire, research on, 379.
curing, function of nitrate, nitrite, and bacteria in, 93.
prepared from carcasses of hogs fed different feed mixtures, quality, 509.
- Bacteria—
anaerobic, *see* Anaerobes.
and insects, biologic relations between, 74.
as colloids, 169.
cation adsorption by, 455.
cell stimulating, attenuation by specific amino acids, 603.
coliform and related, taxonomy, physiology, and morphology, [N.Y.]Cornell 806.
coliform, succinic acid formation by, relation to CO₂ utilization, 455.
disease-producing; soil as source of micro-organisms antagonistic to, 524.
- Bacteria—Continued.
distribution in lakes, 595.
growth, efficiency of energy utilization in, 311.
growth rate, photomicrographic study, 170.
growth, relation between food concentration and surface for, 312.
halophilic, growth, effect of protein concentration and cysteine, 726.
halophilic, growth in concentrations of sodium chloride above three molar, 726.
important to dairy industry, growth on new standard milk agar, 386.
in milk and soil, *see* Milk and Soil.
life and death of, 446.
luminous, physiology of luminescence and respiration of, 169.
marine, thermal sensitivity, 170.
photosynthetic purple, absorption spectra of water extracts, 16.
progress in study, 455.
recent electronmicroscope findings on, 430.
seed-borne, of crop plants, control, N.Y. State 630.
spore-forming, responsible for type A and type B milky diseases of Japanese beetle larvae, 503.
suspended in air, efficacy of ultraviolet light sources in killing, 22.
use of amino acids by, enzymes concerned in, 603.
use of hydrocarbons by, 745.
vitamin requirements, U.S.D.A. 668.
- Bacterial—
fungus antagonisms, 455.
growth, effect of onion juice, 603.
spores, germicidal activity of hydrogen peroxide on, 240.
- Bactericidins in sera of fowl, 532.
- Bacteriologic culture media, *see* Culture media.
- Bacteriology—
dairy, papers, 239.
dairy, use of tributyrin agar in, 240.
elementary, textbook, 23.
implications of variability on species concept in, 455.
textbook, 23.
veterinary, textbook, 813.
- Bacteriolysins, natural, studies, 169.
- Bacteriophage(s)—
and legume bacteria, 168.
glycine an essential growth factor, 21.
in soil, U.S.D.A. 735.
sizes and methods for determination, 669.
- Bacterium*—
coli—*see also* *Escherichia coli*.
reduction of dehydroascorbic acid by, [N.Y.]Cornell 806.
malvacearum, relation to anthracnose boll rot of cotton, 629.
neorophorum strains, antigenic relations 390.

Bacterium—Continued.

- phaseoli* and bean mosaic virus, association, 628.
- salicis*, associated with willow water-mark disease, 489.
- salmonicida*, notes, 245.
- tabacum* invasion of tobacco leaves, mechanism, 627.
- tabacum*, notes, Pa. 480.

Bactrocera cucurbitae, see Melonfly.

Badianus manuscript of Vatican library, an Aztec herbal of 1552, 445.

Baeoanusia minor, hyperparasite of black scale, Calif. 791.

Bagasse dangerous as poult litter, Okla. 802.

Bahia grass, establishment, 36.

Balantidium from swine, changes in dimensions upon cultivation, 249, 530.

Balsamroot, arrowhead, composition, effect of stage of maturity, Idaho 372.

Bamboo—

- propagation and utilization, P.R. 618.
- scale predators, liberations, P.R. 640.
- scales, old infestations, *Kearfottia* n.sp. on, P.R. 640.
- species, susceptibility to powder-post beetle, tests, P.R. 640.

Banana(s)—

- effect on disappearance of complex carbohydrates from alimentary tracts of children, 551.

Gros Michel, fertilizer experiments, 476.

industry in Caribbean area, U.S.D.A. 882.

leaf spot due to *Cercospora*, P.R. 630.

shade for, 486.

leaf spot due to *Cercospora*, P.R. 630.

plants, feeding value, 656.

respiration during ripening at tropical temperatures, 764.

Bang's disease—

- agglutination test for, Ind. 243.
- ceased reactor to, significance, 527.
- control, cooperative, calfhood vaccination as aid, 671.

control in Illinois, 815.

eradication and control, 246.

eradication, benefits from, U.S.D.A. 104.

in range cattle, Mont. 668.

rapid or plate agglutination test for, effect of variations in technic, 527.

relation to public health, 246.

studies, 888, 818, Colo. 668, Ind. 243, Mont. 527, Tex. 818, U.S.D.A. 813.

suppression, U.S.D.A. 813.

vaccination for, 246, 388.

worthlessness of Bowman's and 3-V tonic as remedies, Wis. 669.

Barberry eradication for wheat stem rust control, U.S.D.A. 768.

Bark beetles, trees killed by, salvage of timber in, 870.

Barley—

- breeding, Ariz. 38, Colo. 612, Mont. 612, N.J. 751, [N.Y.] Cornell 751, Okla. 752, S.Dak. 752, Tex. 752, U.S.D.A. 751, W.Va. 754.

Barley—Continued.

corn and wheat, comparison in diet of chickens, 802.

covered smut fungi, physiologic races, Idaho 342.

covered smut, natural inoculation of seed with, 61.

culture experiments, Mont. 612, Okla. 752.

fall-sown, rough and smooth awned segregates in, winter survival and yield, 178.

foot disease, new cause of, 773.

grinding, for fattening swine, Okla. 795.

improvement for industrial uses, aims and methods, 613.

in greenhouse, growth and yield, effect of phytohormone dust seed treatment, 451.

in lamb-fattening ration, Okla. 795.

loose smuts, identification, and species integrity, 629.

loose smuts in mixtures, detection, U.S.D.A. 768.

mechanical injury to, causes, S.Dak. 828.

mildew, new genetic factors for resistance to, 773.

planting tests, W.Va. 754.

plants, absorption of bicarbonate ion by, 595.

respiration, formation of pyruvic acid in, 451.

roots, excised, salt accumulation by, methods of sap expression for study, 307.

seed, variations in trueness to variety and in productiveness, N.Y.State 616.

variety tests, N.Dak. 180, N.J. 751, Okla. 752, Tex. 752, W.Va. 754.

Velvon, new smooth-awned variety, Utah 466.

winter, as corn substitute, Okla. 752.

winter, merits as grain crop, N.J. 751.

winter, rate of seeding, Ind. 179.

yields in Delta area, Miss. 319.

Barns, dairy, lighting, U.S.D.A. 823.

Bartram, John and William, botanists and explorers, treatise, 593.

Basisporium gallarum, growth in corncocks, 629.

Bassus stigmaterus, new physiological races, P.R. 640.

Bast fibers, classification and description, 570.

Bathypicotes curculionis, larval parasite of alfalfa weevil, 653.

Batrachodes new species, from South Carolina, 504.

Bats, reproductive cycles in, 316.

Bauhinia reticulata, use as vanilla-supporting trees, P.R. 618.

Bean(s)—see also Mung bean Soybean(s), and Velvetbean(s).

Anguillulina dipsaci on, relation to weed hosts, 639.

aphid, toxicities of optically active nicotine and normicotine, 360.

at different levels of nutrition, response to indoleacetic acid, 451.

Bean(s)—Continued.

- beetle control, R.I. 75.
- beetle, Mexican, insecticides for control, N.Y.State 642.
- beetle, Mexican, new pest in Louisiana, La. 357.
- beetle, Mexican, notes, Ind. 212, [N.Y.] Cornell 786, U.S.D.A. 784.
- Blue Lake pole, grown in Oregon, potentialities for New York State, N.Y.State 185.
- breeding, Mont. 612.
- breeding and selection for disease resistance, Ga. 60.
- broad, mineral deficiencies in, injection for diagnosis of, 449.
- canning, seed condition affecting stand, N.Y.State 619.
- canning, split seeds in, N.Y.State 618.
- curly top resistance in Great Northern U. I. 15 strain, 63.
- curly top, varietal resistance and susceptibility to, 58.
- disease-resistant, development, Idaho 342.
- diseases, insect transmission, Mont. 642.
- diseases, seed-borne, problems of, N.Y. State 202.
- embryos, isolated, effect of β -indoleacetic acid on, 452.
- fertilization, Ga. 44.
- grown in two localities of Michigan, vitamin B₁ in, 281.
- hard-shell seeds in, 469.
- leaf variegation in, inheritance, 629.
- leaves, starch hydrolysis following spraying with α naphthalene acetic acid emulsion, 452.
- lima—
 - bush, root-top ratio as index of adaptability to ecological conditions, 185.
 - fertilizer requirements for, 186.
 - fresh, frozen, and canned, methods for determining quality, 838.
 - germinating, chemical control of molds in, 469.
 - germination, abnormalities in, 470.
 - improvement, Okla. 757.
 - injury by *Empoasca fabalis*, P.R. 640.
 - seed treatment, N.Y.State 630.
- mosaic resistance in Great Northern U. I. 15 strain, 63.
- mosaic severity and control by resistant varieties, N.Y.State 630.
- new gray mold on, 60.
- phyllod flowers, morphological and anatomical features, 776.
- planting machinery, [N.Y.]Cornell 826.
- pod borer, lima, in Puerto Rico, P.R. 82.
- pod meal of broad beans, composition and nutritive value for ruminants, 229.
- pole, use of corn for supporting vines of, N.Y.State 618.
- pole, variety tests, Ala. 44.
- powdery mildew resistance, new factor for, 58.

Bean(s)—Continued.

- red kidney, variability in viability and uniformity of plants, N.Y.State 618.
- rust in Quebec, U.S.D.A. 190.
- rust, inheritance of resistance to, 58.
- rust resistance to physiologic races, 629.
- seedlings, effect of naphthalene acetic acid on mobile auxin in, 20.
- seeds soaked in water, decreased germination from, 10, 597.
- snap, carotene in, 847.
- snap, improved new strains, N.Y.State 618.
- snap, seed germination, effect of soil fumigants, Tex. 771.
- variety tests, Ga. 44, Pa. 472.
- weevil, longevity and egg production in, 505.
- wild, chromosome number, 28.
- Zenith, new variety, 719.
- Bear, damage to seed and seedlings on cut-over Douglas fir lands, U.S.D.A. 641.
- Beauveria*—
 - bassiana* spores for control of Japanese beetle, 651.
 - sp. from southern pine bark beetle, biology, 781.
- Beaver—
 - mountain, damage to seed and seedlings on cut-over Douglas fir lands, U.S.D.A. 641.
 - restoration, Tex. 782.
- Bedbug—
 - eggs, development, hatching, and mortality, relation to climate, 700.
 - experiments with liquid insecticides in houses infested with, 362.
 - fasting, longevity, 645.
- Beech—
 - bleeding canker, control, R.I. 60.
 - dying, near Philadelphia, associated with *Phomopsis* sp., U.S.D.A. 342.
- Beef—see also Cattle, beef.
 - buying by grade, U.S.D.A. 271.
 - Federal grading, U.S.D.A. 374.
 - grass-fed v. grain-fed, 226.
 - production, beginnings in, Miss. 372.
 - production on crested wheatgrass, bromegrass, and native range, Mont. 656.
 - quality, factors affecting, U.S.D.A. 794.
- Beehive covers, effect of color on temperature within, 87.
- Bee(s)—
 - adaptability of native plants for, Tex. 787.
 - changing pasture for, 224.
 - combs, moth pests of, 371.
 - female, biochemical aspects of differentiation, 505.
 - fly, immature stages, external morphology, 368.
 - foulbrood, see Foulbrood.
 - poison system of, 505.
 - queen, effect of feeding on weight, U.S.D.A. 784.
 - queen rearing, Tex. 787.
 - resistant to disease, U.S.D.A. 784.

Bee(s)—Continued.

- serious losses of last few years, cause, Utah 86.
- studies, Okla. 786, Tex. 787, U.S.D.A. 784, Utah 787.
- toxicity of tartar emetic to, 654.
- wintering v. package, 371.

Beet(s)—

- anatomical structure, effect of fertilizers on, N.Y.State 618.
 - and spinach, relative rates of production of asparagine and glutamine, R.I. 18.
 - boron deficiency in, 629.
 - canning, boron requirements, N.Y.State 618.
 - color and sugar content, environmental factors affecting, Conn.[New Haven] 471.
 - field or fodder, *see* Mangel(s).
 - harvesting machinery, Idaho 399.
 - intensive production on sandy land, soil management for, Conn. [New Haven] 443.
 - internal break-down, control with boron, 204, [N.Y.]Cornell 759.
 - leaf sawfly, 788.
 - leafhopper, control, Tex. 787, U.S.D.A. 784, Utah 787.
 - leafhopper, mechanical protection of tomatoes from, Idaho 357.
 - piles, storage losses in, Colo. 678.
 - pulp, dried, v. mangel beets, comparison, on total-digestible-nutrient-replacement basis, [N.Y.]Cornell 805.
 - quantity and distribution of different elements in, Utah 735.
 - seed, selecting for germination testing, 469.
 - seed, treated and untreated, germination, 470.
 - single seed ball planting, Colo. 678.
 - stocks, variability in viability and uniformity of plants, N.Y.State 618.
 - sugar, *see* Sugar beet(s).
 - top silage for fattening steers, N.Dak. 508.
 - tops, nitrate content, Colo. 668.
- Beetle, fungus-eating, new to Puerto Rico, 357.
- Belladonna, growth effects of thiamin chloride, ascorbic acid, and phytohormones, 596.
- Bembis wasps, enemies of sheep blowflies, 792.
- Bentgrass—
- breeding, R.I. 34.
 - fertilization, comparison of nitrogen carriers for, 36.
 - Raritan velvet, value for lawns, N.J. 751.
 - varieties and strains, seed production, R.I. 34.
- Berberi remedies, Chinese plant, vitamin B, in, 703.
- Bermuda grass—
- introduced into Utah, Utah 43.
 - lespedeza pasture production, fertilizers and limestone for, Ga. 34.

Bermuda grass—Continued.

- pasture, value of manure and fertilizers for improving, Tex. 806.
- Berries, *see* Fruits, small, and Raspberries, Strawberries, etc.
- Beverages, sulfur in, 127.
- Bibliography of—
- Actinomycetes, morphology and physiology, 342.
 - agriculture in primitive cultures, U.S. D.A. 544.
 - almond leaf and flower buds, marked histogenic differences in, Calif. 454.
 - anthropology and agriculture, U.S.D.A. 544.
 - Ascaridia lineata*, immunization of poultry to, 252.
 - Ascomycetes, 593.
 - Aspergillus niger*, distribution in Germany, 342.
 - banana industry in Caribbean area, U.S.D.A. 882.
 - bees, female, biochemical aspects of differentiation, 505.
 - boron as plant nutrient, 22.
 - botany of Oregon, 304.
 - cattle diseases, 818.
 - Olostidium chauvoei* aggrassin, 104.
 - codling moth, U.S.D.A. 493.
 - corn, role in development of civilization of the Americas, U.S.D.A. 257.
 - cotton linters, U.S.D.A. 543.
 - dairy chemistry, 517.
 - exhibits, U.S.D.A. 546.
 - farm families, relocation, U.S.D.A. 119.
 - fox encephalitis, 820.
 - ice cream, 243.
 - insect biochemistry, 74.
 - insemination, artificial, in livestock breeding, U.S.D.A. 316.
 - lactation, 385.
 - mammals, American, 70.
 - maté, U.S.D.A. 411.
 - medical mycology, 523.
 - micro-organisms, antagonistic interrelations, 604.
 - microscopy, fluorescence in biology, 602.
 - milk, pasteurized, thermotolerant bacteria in, 664.
 - Mucorineae, guide to, 160.
 - nicotinic acid relation to pellagra, 851.
 - North American forestry, U.S.D.A. 196.
 - nutrition in India, 548.
 - pantothenic acid, 373.
 - personnel administration and personnel training, U.S.D.A. 268.
 - plant galls and gall makers, 497.
 - plants, alien, 594.
 - potato, genetics, cytogenetics, and breeding, 605.
 - price fixing by foreign governments, U.S.D.A. 262.
 - publications of W. S. Blatchley, 357.
 - rural leadership, 688.
 - Sarcocystis* in birds, 535.
 - social and economic research, sampling method in, U.S.D.A. 834.
 - social insurance and agriculture, 545.

Bibliography of—Continued.

- soil erosion, U.S.D.A. 588.
 soil moisture, U.S.D.A. 588.
 sugarcane, 183.
 sugarcane borer, in Barbados, 219.
 tropical agriculture, 718.
 tuberculosis, effect of diet on resistance to, 855.
 tuberculosis eradication in United States, 671.
 whitefly greenhouse parasites, value, Mich. 88.
 wireworms, biology and control, Pa. 85.
 Big Horn River, salinity condition in during 1938-39, Wyo. 400.
 Bilirubin in blood plasma, source of, 275.
 Bitweed—
 control, Ariz. 33, Idaho 319, S.Dak. 752
 fungus disease, 69.
 Rhizospira parasitizing, Idaho 342.
 Biochemistry and agrostological problems, 150.
 Biology—
 research, statistical methods for, 287.
 specimens, preserving, U.S.D.A. 725
 Biotin—
 action on growth of mycorrhiza, 743.
 as growth stimulant for root nodule bacteria, 742.
 deficiency in chicks and egg white injury, 233.
 effect on growth of legume bacteria, Wis 582.
 effect on yeast growth, 22.
 Birch—
 borer, bronzed, relation to dying of birch in New Brunswick forests, 651.
 trees, living, heart-rotting fungi in, role of *Stereum murrayi*, 637.
 yellow, leaves, parasitized by *Taphrina bacteriosperma*, 780.
 Birdbanding, 213.
 Bird(s)—
 as factor in controlling insect depredations, 213.
 as hosts of equine encephalomyelitis virus, 250.
 autumn, of eastern bobwhite experimental game management area, in southern Iowa, 492.
 common names, spelling of, 355.
 eating tent caterpillars, 366.
 feathers, pigment production, effect of X-rays, 749.
 feeding on oak products, 490.
 field study, suggestions for, 213.
 game, cannibalism among in captivity, salt as curative, 355.
 game, food crops for, Ala. 73.
 game, in United States, original and present breeding ranges, 213.
 game, migratory, status of, 213.
 game, parasites, in Illinois, 641.
 Mexican wild, blood protozoa obtained from, 214.
 North American, life histories, 73.
 of eastern and central North America, natural history, 213.
 of New York, behavior, economic status and management, [N.Y.] Cornell 781.
 of Oregon, 492.
 of world, check list, 213.
 of world, systematic classification, 492.
 ornamental woody plants attractive to, 213.
 trematode parasites from, in Louisiana, 668.
 Birth rate, rural, in Oklahoma, Okla. 834.
 Bison, American, in United States and Alaska, status, 213.
 Bisulfite binding substances—
 and thiamin deficiency, 706.
 in blood and cerebrospinal fluid, 705.
 Bitterweed—
 germination and longevity of seed and control, Tex. 753.
 western, control, 471.
Bittes ingae on *Inga* spp., 632.
 Black disease and mastitis in sheep, Mont. 668.
 Black Hills beetle, U.S.D.A. 784.
 Black scale—
 control, 218.
 effect of sulfur on, U.S.D.A. 783.
 parasites, in Africa, Calif. 791.
 Blackberry (ies)—
 culture and disease control, Ill. 53.
 dwarf in boysenberries and youngberries, U.S.D.A. 842.
 new, introduction, U.S.D.A. 756.
 production, prices, returns, etc. N.H. 685.
 Blackfly (ies)—
 on turkeys, feeding activity, 650.
 Rocky Mountain, studies, 503.
 Blackleg aggressin, serological studies, 104.
Blakeslea trispora, notes, 200.
 Blatchley, W. S., chronological account of work, and bibliography of his publications, 357.
Blattella germanica, see Cockroach, German.
Blissus—
 hirtus, see Chinch bug, hairy.
 leucopterus, see Chinch bug.
 Blister beetle—
 black, effect of pyrethrum and derris, 369.
 control, S.Dak. 786.
 Blood—
 and cerebrospinal fluid, bisulfite binding substances in, 705.
 banked, prothrombin changes in, 715.
 capillary, micro-prothrombin test with, 568.
 carotene in man, effect of liquid petrolatum, 848.
 cell, red, as source of iron and bilirubin of blood plasma, 275.
 cells, red, in healthy young women, diameter, 415.
 coenzyme I level of, relation to dietary intake of nicotinic acid, 707.
 constituents of cattle, effect of atmospheric temperature, 229.
 cultures, buffered, 814.

Blood—Continued.

- groups, studies, methods of securing blood from rats for, 456.
- human, lead in, 700.
- lead in, effect of calcium, phosphorus, and vitamin D, 699.
- of children, vitamin A in, relation to biophotometer tests, 559.
- of dogs, coagulation time, effect of hookworm infestation, 106.
- of fowl, erythrocyte, leucocyte, and thrombocyte count, determination, 532.
- of normal and mentally diseased men, calcium and phosphorus in, 846.
- picture, bovine, in health and under parasitism, 668.
- pyruvate in vitamin B₁ deficiency in man, effect of exercise on, 134.
- recent electronmicroscope findings on, 430.
- serum of fowls, bactericidins in, 532.
- sugar of fowls, effect of coccidiosis, 106.
- sugar values of rats receiving xylose or galactose, 844.
- vitamin B₁ in, estimation, 9.

Blowfly(ies)—

- citronella oil for protection of lambs against strike, 248.
- destruction of larvae and pupae in carcasses and in soil, methods, 83.
- laboratory rearing for 200 generations, 83.
- of sheep, *Bombie* wasps as enemies, 792.
- parasite, indigenous, introduction into Uvalde County, Texas, 224.
- reared from struck sheep, analysis of results, 84.
- strike in sheep, prevention and treatment, 222.

Blueberry(ies)—

- bud mite, a new pest, 74.
- canes, productive life of, N.J. 761.
- cultural requirements, N.Y. State 618.
- fertilization and soils for, N.J. 761.
- high-bush, culture in Rhode Island, R.I. 621.
- improvement, W.Va. 758.
- maggot, adaptability in respect to hosts, 222.
- protecting from damage by herring gulls, 212.
- types or species marketed in different sections, U.S.D.A. 762.
- varieties, N.J. 761.

Bluegrass—

- bulbous, for reseeding intermountain ranges, 613.
- Canada, seed, sensitive to germinative conditions, 470.
- Kentucky, progeny test as measure of types of seed development in, 467.
- mineral composition, effect of soil type and treatment, 446.

Boars, castration under chloroform anesthesia, 249.

Bobwhite, *see* Quail.

Body parts, differences in size, factors governing, 314.

Bollweevil—

- and cotton leaf aphid control, combination of insecticides for, 494.
- control, La. 357, Tex. 787.
- control, effect of insecticides used for, on aphid and mirid infestations, 371.
- control, field test of timed poisoning schedules for, 494.
- control, insecticides tested for, 78, 371, 494.
- control, mixtures of calcium arsenate and sulfur for, 494.
- control with calcium arsenates of different percentages of arsenic pentoxide, 86, 494.
- injury to cotton, alternative method of measuring, 494.
- migration, hibernation, and control, Tex. 787.
- studies, U.S.D.A. 784.

Bollworm—

- biology and natural control, Tex. 787.
- insecticides for, tests, 78.
- oviposition, relation to flowering curves of food plants, 366.
- parasite, biology, 83.
- parasites in quantitative relation to bollworm populations in South Africa, 219.
- pink, diapause in, nature and origin, 81.
- pink, notes, Tex. 787, U.S.D.A. 784.
- spotted, and parasites, 788.
- studies, U.S.D.A. 784.

Bombardia n.sp. on dry twigs of *Thunbergia grandiflora*, 200.

Bone—

- ash of chicks, effect of minerals and vitamin D on, 513.
- composition in extreme osteoporosis associated with hepatoma, 416.
- lead in, effect of calcium, phosphorus, and vitamin D, 699.

Books on—

- agriculture, Belgian, rural cooperation in, 262.
- air and its mysteries, 153.
- animals, farm, breeding, growth, and inheritance, 794.
- bacteriology, 23.
- Bartram, John and William, 598.
- botany, 445.
- climate and acclimatization, 12.
- cooperation, Belgian rural, a study in social adjustment, 262.
- economics with applications to agriculture, 681.
- entomology, introduction to, 74.
- farm machinery, repairing, 109.
- food buying, 694.
- food for the family, 694.
- food inspection, 270.
- histological and cytological technic, 100.
- home economics, functioning program, 268.
- insect transmission of plant diseases, 57.
- mammals, American, 70.
- marketing, elements of, 262.
- migrants, 692.
- milk distribution as public utility, 115.

Books on—Continued.

- mosquitoes, control, 219.
 - nomenclature, zoological, 639.
 - nutrition, essentials of, 841.
 - parasitology, 100, 523.
 - pigs, production in South, 231.
 - plant diseases, 58.
 - plant diseases, insect transmission, 57.
 - plant protection, scientific principles, 341.
 - plants, aquatic, 158.
 - plants, culture in nutrient solutions, 25.
 - poultry breeding, 511.
 - poultry management, 231.
 - rural life in process, 683.
 - rural society, organization and changes, 411.
 - statistical analysis, methods, 287, 858.
 - statistical methods for medical and biological students, 287.
 - statistical reasoning, 718.
 - sugarcane, 183.
 - synoptic meteorology, 441.
 - veterinary bacteriology, 813.
 - veterinary history, American, 100.
 - virus studies, 631.
 - weather analysis and forecasting, 441.
 - wheat, world, planning and economic planning in general, 689.
- Borax** on alfalfa and as herbicide, tests, Idaho 319.
- Bordeaux** formulas for potatoes, N.J. 769.
- Boron**—
- absorption by sunflower seedlings, 449 as plant nutrient, bibliography, 22.
 - availability in soil and distribution in plants, 303.
 - availability in soils, effect of liming, Ala. 13.
 - availability, relation to soil moisture, [N.Y.]Cornell 759.
 - copper, and manganese simultaneously determined in mixed fertilizers, 730.
 - deficiency and internal cork of apples, 66.
 - deficiency, effect on reproduction and lactation, Wis. 693.
 - deficiency in apple, 210, [N.Y.]Cornell 769.
 - deficiency in beets, 629.
 - deficiency in crops, symptoms and diagnosis, 60.
 - deficiency in plants of cabbage family, symptoms, Me. 633.
 - deficiency in soils, Conn.[New Haven] 442.
 - deficiency in soils, sunflowers as indicator, 463.
 - effect on plant growth, N.J. 735.
 - requirement of N.J. soils, N.J. 735.
 - studies, R.I. 34.
- Botanical**—
- explorations in Peru, historical résumé, 159.
 - microtechnic, elements of, 169.
 - Review, indexes, 593.
 - Society of America, papers, 15.

Botany—

- during last hundred years, effect of microscope, 310.
 - of Canadian Eastern Arctic, Pteridophyta and Spermatophyta, 593.
 - of Oregon, bibliography with notes on botanical explorers of the State, 304.
 - range and pasture, studies in, 159.
 - textbook, 445.
- Botfly**—
- horse, unpublished records of specimens, 221.
 - sheep, larvae, control where winters are cold, 673.
 - sheep, larvae, large-scale treatment for destruction, 673.
 - throat, unpublished records of specimens, 221.
- Botryosphaeria ribis* on *Cerolis* and *Bensoin*, U.S.D.A. 768.
- Botrytis cinerea* from pinewood soil, 202.
- Botulism studies, Mass. 124.
- Boxwood, varietal forms in, descriptive study, 159.
- Boysenberry (ies)**—
- blackberry dwarf affecting, U.S.D.A. 342.
 - canes, overwintered, canker and dieback disease, 58.
 - training, 762.
- Braconhyrminus*—
- lugustici*, see Alfalfa snout beetle.
 - ovatus*, see Strawberry root weevil.
 - rugosostriatus*, notes, Utah 787.
- Bradycardia in rats, factors affecting, 703.
- Brambles, methods of protection and fertilization to reduce winter damage, Colo. 334.
- Brass, effect on milk flavor, 808.
- Brassica* species, pungency, effect of variety and ecological conditions, [N.Y.]Cornell 759.
- Brazil nut, composition of shell, 727.
- Bread**—see also Flour.
- and bread ingredients, iron content, 203.
 - doughs, free and bound water in, 546.
 - improvement for Great Britain, 841.
 - staling, progress in research in, 694.
 - white and whole wheat, making with types of yeast and hard wheat flour, Wyo. 269.
- Breeding, see Animal breeding, Plant breeding, and specific animals and plants.
- Brevicoryne**—
- brassicæ*, see Cabbage aphid.
 - genus, table for separation of species, 501.
 - salicinis* n sp., notes, 501.
 - symphoricarpi*, notes, 501.
- Bristle-grass, plains, seed germination, 43.
- Britton, W. B., tribute to, Conn. [New Haven] 575.
- Broccoli, vitamin C in, 135.
- Bromegrass, composition and growth habits, effect of environment, 86.
- Bromegrass, smooth, hay and seed yields, effect of ammonium sulfate on, Idaho 319.
- Bronchitis, infectious, studies, R.I. 101.

- Brooder(s)**—
 chick and pig, heating, U.S.D.A. 823.
 electric, design, Idaho 399.
- Brooks fruit spot control, fungicides and schedules for, N.J. 769.**
- Broomcorn**—
 breeding, Tex. 753.
 inheritance studies, Tex. 753.
 silage for dairy cattle, 384.
- Brown-tail moth, U.S.D.A. 784.**
- Brucella**—
abortus—see also Bang's disease.
 bacterial dissociation in, 388.
 in blood stream and in serous swellings or hygromata, 815.
 infection, immunity to, 246.
 isolation from lymph nodes, 390.
 long-continued cultivation in chick embryos, results, 388.
 plate antigen, preparation, 390.
 soil micro-organisms antagonistic to, 525.
 strain 19, calfhood vaccination with, duration of immunity, 671.
 vaccine, behavior in various excipients, 669.
 culture media for, 815.
 group, capsule formation by, 245, 669, 815.
 group, protein-nucleate and components from, interaction with *Brucella* specific sera, 245.
 infection in cattle, agglutination test for, standardization and interpretation, 671.
 infection in swine, genetic resistance to, 388, 819.
melitensis, epidemic of brucellosis due to, 246.
- Brucellosis**—
 epidemic, due to *Brucella melitensis*, 246.
 in cattle, vaccine to control, 388.
 in dog fed milk from Bang's disease infected cows, 581.
 in dog, sporadic case due to horse meat, 581.
 in horses and goats, 388.
 in horses, cases without clinical symptoms, 674.
 relation to periodic ophthalmia, 388, 674.
 twenty-five years' progress in study, 388.
- Bruchidae and parasites infesting seed pods of cowpea and wild plants, 643.**
- Bruchus brachialis*, see Vetch bruchid.
- Bruchus pisorum*, see Pea weevil.
- Brumus suturalis* predating on aphids, biometrics, 223.
- Bryophyllum*, validity of genus, 600.
- Buckeye, California, distribution in Sierra Nevada, relation to honey production, Calif. 653.**
- Buckwheat seedlings, effect of light, gravity, and centrifugal force, 448.**
- Badmoth**—
 control, N.Y.State 642.
 dormant and summer sprays for, importance, N.Y.State 648.
- Buds, dry preservation, in natural form and color, 602.**
- Buffalo grass**—
 and Sudan grass, comparison, Tex. 753.
 breeding, Tex. 753.
 culture experiments, Tex. 753.
 pasture, establishment, Tex. 753.
 seed, production and germination, Tex. 753.
 seed production, improvement, U.S.D.A. 751.
 seed, testing, 37.
 strains, composition, Tex. 753.
- Buffalo herd, albino, in Alaska, 172.**
- Bulb scale mite, studies, U.S.D.A. 493.**
- Bull(s)**—see also Sires.
 associations, for providing service for high-quality bulls to small dairy herd, Idaho 383.
 physiology of reproduction, role of ascorbic acid in, 173.
 semen, preservation, methods, U.S.D.A. 662.
 slow-breeding, ascorbic acid therapy, directions for, 508.
- Bunostomum trigonocephalum* in sheep—
 and goats, life history, 101.
 anthelmintics against, 818.
- Bunt, see Wheat smut, stinking.**
- Bupalus piniarius*, biology, 788.
- Burroweed**—
 control, Ariz. 33.
 life history, reproduction, and distribution on ranges, Ariz. 33.
- Butter**—
 application of Burri smear technic to, Ind. 235.
 composition and deterioration, 240.
 Federal inspection, requires farm care, Miss. 141.
 flavor, effect of storage temperature, S. Dak. 806.
 graded, consumer reaction to, Ind. 235.
 Indiana, quality, factors affecting, Ind. 235.
 iron and copper in, determination, 151.
 keeping quality, incubation test as indication, [N.Y.]Cornell 99, Okla. 806.
 making, neutralization of cream for, Mich. 667.
 making, vacreating cream for, 522.
 mold mycelia count, 727, Ind. 235.
 mold mycelia in, significance, Ind. 235.
 pH value, effect of different neutralizers, Mich. 667.
 print, bacterial discoloration, 811.
 quality, effect of repeated washings and of intensities of working, Okla. 806.
 quality, factors affecting, Tex. 806.
 quality, from vacuum-pasteurized v. vat-pasteurized cream, Iowa 810.
 texture and flavor, effect of various feeds, Miss. 98.
 weedy cream flavor in, reducing, S.Dak. 806.
 yeast and mold counts, relation to bacterial count and phosphatase reaction, Ind. 235.
- Buttercup, large and small, poisonous to livestock, Colo. 668.**

Butterfat—

- and vegetable oils, comparative nutritive value, 413.
- carotene added to, determination, Ind. 150.
- constants, effect of various feeds, Miss. 98.
- fat acid composition of, U.S.D.A. 663.
- globule, studies, 386, [N.Y.]Cornell 806.
- in milk, factors in cod-liver oil which lower percentage, [N.Y.]Cornell 805.
- melting time, relation to melting point, 98.
- neutralization value, determination, 151.
- of high vitamin A value, vitamin A requirements of dairy cows for production, 235.
- secretion, effect of fat intake and of fat components in ration, [N.Y.]Cornell 805.

Butterflies of Michigan, list, 82.

Buttermilk—

- cultured, effect of standardizing acidity in, Mo. 240.
- cultured, methods of improving, Mont. 662.
- pH value, effect of different neutralizers, Mich. 667.

Buying guides, consumer, U.S.D.A. 855.

Byturus unicolor, see Raspberry fruitworm.

Cabbage—

- aphid, notes, 501.
- ascorbic acid in, effect of variety, season, and soil fertility, 422.
- black rot epidemics, origin, U.S.D.A. 769.
- black rot, seed treatments for, Tex. 770.
- caterpillar, abundance of various species in Charleston, S. C., area, 494.
- caterpillar, notes, U.S.D.A. 784.
- Chinese varieties, classification, description, and culture, U.S.D.A. 331.
- classification according to extent of caterpillar injury, 494.
- clubroot, control with mercurials, 628.
- Copenhagen, effect of colchicine in doubling chromosomes, Tex. 757.
- diseases in Indiana, control, 347.
- family, boron deficiency symptoms in, Me. 633.
- fertilizer experiments, R.I. 34, Miss. 331.
- head shape, effect of environment, Tex. 757.
- leaves and aphids on, auxinic activity, 628.
- looper, control, Tex. 787.
- maggot in radishes and cabbage, control, Idaho 357.
- Marion Market, head shape in, effect of environment, 186.
- root maggots, control, R.I. 75.
- stems, developmental analysis, 760.
- tip burn, effects of potash, 628.
- transplanted, wax coatings on, deleterious effect, W.Va., 758.
- value of rye and vetch green manure crops for, W.Va. 758.
- variety tests, Miss. 331, Pa. 472.
- webworm, notes, Tex. 787.

Cabbage—Continued.

- wilt-resistant varieties, breeding, U.S.D.A. 757.
- yellows control by resistant varieties, N.Y.State 630.
- yellows resistant cauliflower varieties, N.Y.State 205.

Cabbageworm(s)—

- control, N.Y.State 365, Tex. 787, U.S.D.A. 784.
- green, control, R.I. 75.
- imported, biology, population density, etc., 792.

Cacao—

- diseases and pests, 200.
- pods in Grenada, maturation period, 335.
- transpiration and carbon assimilation in, 335.

Ooellus oceanthi, parasite of four-spotted tree cricket, 505.*Ooecocia argyrosipila*, see Fruit tree leaf roller.

Cactus—

- giant, bacterial necrosis, 628.
- prickly-pear, biological control, 217, 329.

Cadelle, notes, Mont. 786.

Caesalpinia to Carpinus, host-parasite check list revision, U.S.D.A. 342.*Oafanus* seed, catalase activity at different stages, 446.

Cake, high-sugar-ratio, relation of mixing methods and formula to quality and economy in, 414.

Calacarus adornatus on camellia, 655.

Calcium—

- and phosphorus metabolism in Indians on rice and on wheat diets, 416.
- and phosphorus requirements in Edwards Plateau, Tex. 814.
- arsenate and inert ingredients, compatibility, 627.
- assimilation, effect of orange juice on, 275.
- available, studies, Ga. 122.
- blood, of fowls, effect of parathyroid preparation on, 513.
- copper, zinc, and sulfur, studies, 582.
- cyanamide for pear thrips control in prune orchards, 642.
- effect on lead in blood and bone, 699.
- in blood of normal and mentally diseased men, 846.
- in diet, retention by children, 845.
- in gastric juice, 275.
- in relation to phosphorus utilization by crops, 179.
- ion, relation to sloughing of potatoes, 414.
- level of blood of fowls following theelin injections, 233.
- metabolic balance, in Eskimo children, 554.
- metabolism in rats and dogs, effect of mineral oil ingestion, 846.
- metabolism of fowls, effect of parathyroid preparation, 513.
- metabolism, studies with its induced radioactive isotope, 552.

Calcium—Continued.

- of dicalcium phosphate, utilization by children, 845.
- retention by preschool children, 552.
- retention in children, effect of lactose, 845.
- role in iron assimilation, 553.
- serum fractionation, in Ayrshire cows, 518.
- serum, partition, at time of parturition in dairy cow, 518.
- submicroquantities, estimation, 438.
- sulfate, *see* Gypsum.
- utilization, from various food mixtures, measuring, Conn.[New Haven] 547.

Calendula seeds, tests, N.Y. State 624.

California Station, notes, 289, 431.

California University, notes, 288, 431.

Oalochorus, factors affecting speciation in genus, 592.

Oalosoma sp., feeding habits, 503.

Calf(ves)—

- beef, economy of a wintering, pasturing, and dry-lot finishing for, Idaho 372.
- beef, fattening, cottonseed cake v corn for use with oats, Okla. 795.
- beef, production, Miss. 89.
- brought in from ranges and placed on alfalfa pastures, control of death losses in, Ariz. 101.
- effect of feeding vitamins A and D in concentrated cod-liver oil with hay, Vt. 235.

fattening—

- comparison of feeds, Mich. 659.
- free-choice feeding plan, Okla. 795.
- hybrid v. open-pollinated corn for, Ohio 90.
- on barley and molasses beet pulp, Mont. 655.
- ration, barley v. No. 2 corn, Okla. 795.
- value of mixed shelled corn and ground ear corn for, Ind. 226.

feeding of phosphorus supplement prior to weaning, 790.

from cows v. calves from heifers, Ohio 90.

Hereford, familial cerebellar hypoplasia and degeneration in, 247.

immunity to hookworm and nodular worm infection in, 394.

iron-treated cottonseed meal for, Ohio 90.

length of intestine, relation to absorption of nutrients from chyme, 662.

on pasture, adding supplement to corn for, Ohio 91.

performance, effect of breeding, Miss. 653.

quality of meat produced by, and record-of-performance studies of beef sires, Mont. 656.

raising on skim milk powder, Mont. 662.

scours, prevention, U.S.D.A. 662.

southern and western raised, parasitic hazards in New York, 818.

Calf(ves)—Continued.

- spring and fall, relative returns from fattening, 226.
- triplet, are they identical?, 605.
- vitamin A requirements, U.S.D.A. 662.
- vitamin B group requirements, [N.Y.] Cornell 795.
- winter feeding, green oat grazing v. sorghum silage, Tex. 796.
- wintering, corn supplements with oat grazing v. silage for, Tex. 796.

Camellia—

- anthracnose, 627.
- yellow spot, a virus disease, 58.

Camels, feeding, 659.

Campoplexidea genus in America north of Mexico, revision, 371.

Campsomeris spp., beneficial Javanese, life history, 654.

Canalgre tubers as source of tannin, tests, Tex. 757.

Canary(ies)—

- apoplexy in, 253.
- infected with *Plasmodium cathemerium*, development of acquired immunity in, 253.
- Salmonella suspestifer* infection in, 677.

Canary grass, bulbous, hardy selection, Idaho 319.

Candlenut, composition of shell, 727.

Candy, whey solids in, 811.

Canine distemper virus, infections produced in ferrets by, 243.

Canna tops and tubers, feeding value, 656.

Cannibalism among game birds in captivity, common salt as curative for, 213, 355.

Cantaloup, *see* Muskmelon(s).

Capillary fragility and ascorbic acid studies, 852.

Capitophorus cefemithi n.sp., description, 363.

Capons—

- production and marketing, Iowa 382.
- production on limited range, profit in, Okla. 802.

Carabaos—

- dairying possibilities, 518.
- milk production, effect of concentrate feed, 518.

Carabid beetles, feeding habits, 503.

Carbohydrate(s)—

- dynamic effects, Pa. 507.
- enzymatic break-down and synthesis, 17.
- metabolism during prolonged fasting in dogs, 124.
- metabolism, symposium on, 697.
- research, U.S.D.A. 725.

Carbon dioxide, bacterial fixation, heavy carbon as tracer in, 170.

Oares genus, chromosome numbers and meiosis in, 813.

Caribbean pod borer in Puerto Rico, P.R. 82.

Carnation(s)—

- bacterial disease, [N.Y.] Cornell 769.
- bacterial wilt, 779.
- basal blight, causal fungus, 61.
- central bud rot, relations to *Pedicularis graminum* and *Fusarium poae*, 352.

Carnation(s)—Continued.

- control of onion thrips on, 645.
- culture in cinder and gravel for greenhouse flowering, 194.
- diseases, effect of cutting-bench treatments on, 628.
- flowering, and intermittent light, 337.
- in cold storage rooms, ethylene injury to, 339.
- potassium deficiency in plants, symptoms, 211.
- requirements for soilless culture, Ohio 765.

Carneocephala flaviceps, see Leafhopper, yellow-headed.

Carotene—

- determination, adsorption method for, 731.
- determination, in presence of lycopene, 731.
- determinations of feeds, Tex. 657.
- in alfalfa hay, utilization by hens, Idaho 372.
- in artificially dried grass and hay, stability and estimation, 508.
- in colostrum from cows, 519.
- in fresh and frozen vegetables, determination, 847.
- in grasses and clovers, 89.
- in hay, relation to color, Okla. 806.
- in market milk, 848.
- loss in carefully stored baled hay, Okla. 795.
- requirement of poultry, Idaho 372.
- soybean, chromatographic identification and biological evaluation, 731.
- vitamin A activity in different vegetable fats, Ind. 227.

Carotenoid(s)—

- in liver of man and animals, 279.
- pigments, Ind. 150.

Carpet beetle(s)—

- black, effect of paradichlorobenzene on feeding, 357.
- black, studies, U.S.D.A. 784.
- lures and traps to control, 70.
- resistance of treated textile fabrics to, test for, 650.

Carpet grass pastures, production, effect of fertilizers, Tex. 753.

Carpocapsa pomonella, see Codling moth.

Carrot(s)—

- edible tap root, developmental anatomy of, Calif. 455.
- growth and anatomical structure, effect of boron deficiency, 745.
- intensive production on sandy land, soil management for, Conn.[New Haven], 443.
- Macrosporium* leaf blight, Ariz. 59.
- stocks variability in viability and uniformity of plants, N.Y.State 618.
- weevil, N.J. 786.

Carya genus, host-parasite check-list revision for, U.S.D.A. 342.

Caryospora—

- minima* n.sp. description, 61.
- putaminum*, life history, characters, and taxonomy, 61.

Caryota to *Castanopsis*, host-parasite check-list revision, U.S.D.A. 630.

Casein fibers, chemical identification, 717.

Casein, light white, vitamin A in, 280.

Cassava(s) —

- diseases and pests, 200.
- testing, Ariz. 44.
- treatment with colchicine, 810.

Castanea, host-parasite check-list revision, errata for, U.S.D.A. 768.

Castilla to *Celtis*, host-parasite check-list revision, U.S.D.A. 630.

Castor-bean(s)—

- growth effects of thiamin chloride, ascorbic acid, and phytohormones, 596.
- irrigation tests, Tex. 753.
- leaf, cytophysiologic studies of petiolar nectaries, 745.
- plants, reactions of grasshoppers to, 645.
- variety tests, Tex. 752.
- wilt in Brazil, 211.

Cat(s)—

- flea, distribution and hosts, 74.
- preovulatory development and changes in follicles, including maturation of ova, 315.
- tickicide and insecticide for, 655.

Catalase and respiration, relation between, 16.

Catana clauseni n.sp., description, 223.

Catana new genus, erection, 223.

Cataract in rats—

- failure of galactose given subcutaneously to produce, 698.
- fed galactose, effect of exercise on development, 417.
- galactose and xylose produced, blood sugar levels in, 844.

Catenophora pruni n.g. and n.sp., description, 68.

Oathnaemasia nycticoracis n.sp., from herons, 641.

Oatharinaea mulleri, *Neotiella oatharinaea* on, 200.

Cattle—see also Calf(ves), Cow(s), Heifer(s), Livestock, and Steer(s).

artificial insemination—

- and semen storage for, U.S.D.A. 747.
- for breeding, advantages, limitations, and uses, U.S.D.A. 316.
- results from, Idaho 316.
- attacked by starlings in Plains States, 356.
- baby beef, production, creep feeding and purebred bulls for, S.Dak. 795.
- baby beef, winter-finishing on corn in different forms, comparison, Tenn. 230.
- beef—
 - and dual-purpose, breeding and crossing, U.S.D.A. 747.

Cattle—Continued.

- beef—continued.
 - and dual-purpose, feeding, U.S.D.A. 794.
 - breeding herd, winter feed requirements, Ga. 89.
 - fattening rations, oats and cottonseed cake in, Okla. 795.
 - feeding tests checked at packing house, Colo. 874.
 - kudzu as grazing crop, Ala. 88.
 - prices, Ind. 265.
 - rotation and control grazing, Tex. 796.
 - sire performance studies, U.S.D.A. 794.
 - wintering on pasture, Miss. 872.
 - wintering, rations, Mont. 656.
 - young, on summer pasture, value of supplementary concentrates for, Ga. 89.
- breeding in Tanganyika Territory, 313.
- breeds, in Canada, history, 508.
- calcium and phosphorus deficiencies in, treatment and prevention, 229.
- dairy—see also Cows.
 - anatomical relations in, U.S.D.A. 662.
 - and beef, index of purchasing power, N.Dak. 537.
 - broomcorn silage for, 384.
 - carotene requirement for reproduction, Okla. 806.
 - diseases, 818.
 - reproductive efficiency, effect of fertilized pastures, Ga. 89.
 - stables for, N.Dak. 235.
 - value of yeast for, [N.Y.]Cornell 805.
 - vitamin A requirements, Tex. 806.
 - winter feeding, Miss. 885.
- diseases, see specific diseases.
- fattening rations, dried citrus peel and pulp in, Tex. 796.
- fattening, sweetpotato meal for, Ga. 89.
- fattening value of peanuts and vines in rations, Ga. 89.
- grubs, control with derris and cube washes, Ariz. 101, U.S.D.A. 493.
- grubs, notes, U.S.D.A. 784.
- grubs, unpublished records of specimens, 221.
- Holstein and Jersey, improvement in milk and butterfat production by use of proved sires, Idaho 383.
- identification by tattooing, 658.
- in tropical regions, effect of climatological factors, 658.
- income from, possibilities, Colo. 257.
- indigenous and exogenous, in semiarid regions of Union of South Africa, biologic studies, 229.
- lacking vitamin A, vitamin C deficiency in, Wis. 669.
- length of gestation and birth weight, factors affecting, 798.

420580—41—5

Cattle—Continued.

- outbreak of *Listeria* in, 391.
 - parasites, Colo. 668.
 - parasites, external, U.S.D.A. 784.
 - parentage determination in, 388.
 - poisoning, see Livestock poisoning.
 - Plant(s), poisonous, and specific plants.
 - purebred, breeding experiments, U.S.D.A. 662.
 - range beef, mineral and protein deficiencies in, Tex. 796.
 - rate of grazing and effect on progeny, Mont. 656.
 - Red Scindl, birth weights, 658.
 - reproduction in, carotene requirements, U.S.D.A. 662.
 - riboflavin and thiamin in rumen content, 799.
 - rumen digestion in, 383.
 - ticks, see Tick(s).
 - zebu and high-grade European, comparative digestive powers, 229.
- Cauliflower—
- black rot studies, N.Y.State 630.
 - diseases in Indiana, control, 347.
 - fertilizer for, [N.Y.]Cornell 759.
 - magnesium deficiency in, 186.
 - root maggots, control, R.I. 75.
 - varieties resistant to cabbage yellows, N.Y.State 205.
 - vitamin C in, 135.
 - worm control, nonarsenical dusts for, N.Y.State 365.
- Cecropia moth, parasites and hyperparasites of, 506.
- Cedar—
- red, establishing stands of, Okla. 757.
 - red, rust-resistant, 354, W.Va. 771.
 - red, scale, notes, 75.
 - red, seedlings, injury by seed-corn maggot, 222.
 - rust, see Apple rust.
- Cedro shoot borer, U.S.D.A. 784.
- Celastrus scandens* new host for *Glomerella cingulata*, U.S.D.A. 199.
- Celery—
- breeding, [N.Y.]Cornell 759.
 - breeding for blight resistance, Conn.[New Haven] 471.
 - growth, effect of large applications of nitrogen, 186.
 - heartburn v. boron deficiency in, Utah 771.
 - mosaic, western, 480, Utah 771.
 - plant, structure, effect of nitrate level in solution, R.I. 44.
 - root and storage rots, [N.Y.]Cornell 769.
 - storage rot, undescribed, 628.
 - variety tests, Pa. 472.
- Cell—see also Plant cell.
- elongation, physiology of, 448.
- Celloidin sections, method for stamping serial numbers on, 18.
- Cellophane cover slips and method for mounting, 602.

Cellulose—

- crystalline, formation in plastids of living cells, 593.
- decomposition by aerobic organisms, 455.
- decomposition, microbiology, 603.
- industry, chemical cotton, development, 325.

Centipede, garden, notes, Pa. 495.

Centris californica n.sp., description, 793.

Centris rhodomelas n.sp., description, 793.

Centuryplant, histology and cytology, 602.

Cephalanthus to *Olesus*, host-parasite checklist revision, U.S.D.A. 768.

Cephaluros virescens on plants in southern Florida, 636.

Cephalosporium cinnamomeum n.sp. leaf spot of foliage plants, 353.

Cephalothectum roseum spores, 200.

Cephus pygmaeus, see Sawfly, European wheat stem.

Ceratostomella—

- disease of sycamores, spread by pruning, U.S.D.A. 768.

ips and *O. montium*, ascospores, 629.

montium from lodgepole pine, 780.

multiannulata, heterothallism in, 311.

of planetree, transmission in asphalt wound dressings, 629.

pini, notes, 354.

plane tree disease, 639.

spp., effect on specific gravity and strength of pine wood, 490.

ulmi, dissemination, 357.

ulmi, inoculation of elms with, apparent recovery, 488.

ulmi isolated from elm wood of dish crates imported from England, U.S. D.A. 768.

ulmi, isolation from *Scolytus multistriatus* stored at different temperatures, 370.

ulmi spores, microagglutination, 628.

ulmi, uninfected elm wood as source of bark beetle carrying, [N.Y.]Cornell 504.

ulmi, vascular invasion of American elm by, 627.

Cercospora—

genus, monograph, [N.Y.]Cornell 769.

leaf spot of bananas in Puerto Rico, P.R. 630.

leaf spot of peanut, sulfur dust for control, 628.

musae leaf spot of banana, control by growing under shade, 486.

nicotianae, conidial production in culture by, 634.

nicotianae on tobacco, recent research in Ceylon, 634.

oryzae in rice, inheritance of resistance to, 605.

oryzae, resistant factors to, in rice, linkage of, 629.

pitiospori n.sp., description, 354.

Cereal(s)—see also Grain and specific grains. and forage insects, U.S.D.A. 784. and seed products, U.S.D.A. 725. diseases and pests, 200.

Cereals—Continued.

grains, respiration, 744.

loose smut control, new seed-treating machine for, Okla. 770.

mosaic in Voronezh district of U. S. S. R. 203.

plants, growth from dry and soaked irradiated grains, 16.

root-rotting fungi, pathogenicity, effect of crop debris, 61.

rusts—see also Rust(s) and specific hosts.

studies, U.S.D.A. 629.

smut(s)—see also, Smut(s) and specific hosts.

new culture medium for germination of spores, 345.

sulfur in, 127.

Cerebrospinal fluid and blood, bisulfite binding substances in, 705.

Cestode, new, from a hawk, 783.

Cetioicyta new genus, erection, 499.

Ceutorhynchus suturalis, little-known pest of onions, 738.

Chabertia—

larvae, third stage, accessibility to grazing animals, 816.

ovina, tests of various drugs on, 248.

Chaetothrips orchidii on citrus fruit in Florida, 79, 845, 790.

Chaetocnema pulicaria, see Corn flea beetle.

Chaetodacus ferrugineus dorsalis, pupae, acclimation to low temperatures, 651.

Chalaropsis thielavioides, cause of black mold of rose grafts, 353.

Chalcidini in America north of Mexico, descriptions of new species, 654.

Chalcidoidea, Indian parasitic, biological notes, 225.

Chalcoedermis aeneus, see Cowpea curculio.

Chalepus dorsalis, see Locust leaf miner.

Chamaecyparis, *Phytophthora* disease of, 58.

Chaoborus laustris, see Gnat, clear lake.

Chaparral association of northern Baja California, 593.

Chastek paralysis of foxes, prevention, Wis. 669.

Cheese—

American, acidoproteolytic cocci in, 239.

American Cheddar, manufacture, 522.

American, packed in small packages v. bulk, consumers' preference, Wis. 682.

bacteriology, defects of blue cheese, Iowa 522.

brick, bacteriology, 519.

brick, effect of washing curd in manufacture, Wis. 663.

brick, hooping and draining, new method, Wis. 663.

Cheddar, made from pasteurized milk, effect of bacteria on flavor, 241.

Cheddar, making, acidity measurement and relation to grading score, 811.

Cheddar, southern short-cure, quality, effect of various temperature exposures, Tex. 806.

Cheddar, yield and quality, effect of mastitis on, 811.

Cheese—Continued.

- cottage, manufacturing, effect of standardizing acidity in, Mo. 240.
 - cottage, yield and quality, effect of breed of cattle, Okla. 806.
 - curd, consistency, measuring at pitching point, 522.
 - flavor, effect of starters, Pa. 517.
 - hard, ripening process, 239.
 - in consumer-size packages, 811.
 - Limburger, industry in New York, N.Y. State 668.
 - Limburger, made from pasteurized milk, quality, N.Y. State 90.
 - making, measurement and significance of pH values in, 294.
 - making, value of salt in, 242.
 - moisture determination in, use of coconut oil for, 10.
 - packaging, Wis. 663.
 - production, N.Y. State 663.
 - quality improvement, U.S.D.A. 663, 805.
 - research, bacteriological methods in, 239.
 - soft, preservation, application of frozen pack method to, 242.
 - Swiss, moisture in, relation to quality and yield, 241.
 - Swiss, starters, methods of handling, Wis. 663.
 - types, propionic acid bacteria in, 239.
 - varieties, improved by research, N.Y. State 241.
 - vitamin A in, 281.
- Oheilospirura hamulosa*, efficiency of phenothiazine against, 252, 817.
- Chemical compounds having antihemorrhagic activity, 440.
- Chemistry as background for most agricultural research, N.Y. State 150.
- Chenopodium for eradication of worms in lambs, S.Dak. 818.
- Cherry (ies)—
- aphid, black, vector of narcissus mosaic, 642.
 - bacterial canker, N.Y. State 630.
 - breeding, Utah 758.
 - cracking, effect of calcium sprays in reducing, Idaho 329.
 - crinkle disease, 480.
 - diseases in Ozark section of Arkansas, U.S.D.A. 769.
 - improvement and outstanding seedlings, 760.
 - Japanese, undescribed fungus on, 68.
 - juice, new outlet for Utah's fruit crops, 547, Utah 123.
 - juice preparations and blends suitable for beverages, Colo. 693.
 - leaf mottle and lace leaf, Utah 771.
 - leaf spot control, new copper spray for, 210.
 - leaf spot, copper fungicides for control, 629.
 - leaf spot, effective fungicides for, N.J. 769.
 - leaves, photosynthetic activity, effect of fungicides, 210.

Cherry (ies)—Continued.

- little leaf control demonstrations, 486.
 - little leaf, notes, Utah 771.
 - maggot, rotenone sprays for, N.Y. State 642.
 - Montmorency, twig growth in mutants of, 192.
 - native red, destruction by *Leucocera laevicollis*, P.R. 640.
 - new varieties, Pa. 471.
 - orchards, cultural treatment, Mont. 617.
 - pruning, W.Va. 758.
 - rootstocks, mazzard and mahaleb, tests, 52.
 - rootstocks, studies, Utah 758.
 - rusty-mottle, a new virosis, 58.
 - sour, juice yields obtainable from, Colo. 295.
 - sour, pollen, longevity, 47.
 - sour, propagation by piece-root grafting, 352.
 - sour, quality and yield, effect of fungicides, 628.
 - sweet, maturity studies, 333.
 - twig disease, Japanese, 779.
- Chestnut—
- blight eradication, 480.
 - blight-resistant, timber type, breeding for development, 780.
 - blight-resistant varieties, 637.
 - breeding, 637.
 - seedlings, testing, Ga. 56.
- Chia, production tests, Tex. 752.
- Chia, seed production, P.R. 618.
- Chickadee, black-capped, eating tent caterpillars, 866.
- Chick(s)—
- baby, oestrogenic compounds for, relative potency, 463.
 - baldness in, inheritance, Okla. 748.
 - battery, proteins for rations, W.Va. 796.
 - calcium-phosphorus ratio for, Ind. 226.
 - comb response to androsterone, improvement in, with alcohol as vehicle, 318.
 - comb response to androsterone, relation to volume of vehicle, 318.
 - complex nature of alcohol precipitate factor required by 94.
 - congenital goiter in, 510.
 - deficiency disease in, prevented by α -alpha tocopherol, 506.
 - egg white injury, relation to deficiency of biotin, 238.
 - embryo, functional disturbances, oxygen consumption as diagnostic symptom, 511.
 - embryo, growth of viruses on chorio-allantois, 669.
 - embryo, malposition, effect of vitamin A deficiency, 512.
 - embryo, technic for intravenous inoculation of, 251.
 - fiber requirement, Okla. 802.
 - from eggs treated with oestradiol benzoate, sexual development, 32.
 - growth and bone ash, effect of elemental sulfur on, 95.

Chick(s)—Continued.

- growth and feather development, effect of kind of grain in diet, 803.
 - growth, effect of riboflavin supplements, 510, 514.
 - growth, effect of ultraviolet irradiation on, Ind. 227.
 - growth factors required by, 511.
 - growth rate, effect of selenized grain 511.
 - nervous disorder of, 821.
 - nutrition and vitamin B₂, 510.
 - pellagra, prevention, pantothenic acid for Wis. 693.
 - protein feeds for, values, Tex. 232.
 - protein requirements, Tex. 796.
 - relation of thyroid to thymus, 510.
 - Rhode Island Red, color markings in, relation to sex and adult color, 463.
 - sexing, auto-, accuracy, effect of barring gene in red to black down-color phenotypes, 510.
 - sexing, four methods, 608.
 - tolerance for soybean oil, 511.
 - use of food elements by, Nebr. 94.
 - use of selenium by, S.Dak. 802.
 - viability and weight, effect of shipping and time of feeding, 511.
 - vitamin A requirements, Pa. 507.
 - vitamin A requirements, determined by nasal histology, 510.
 - vitamin D requirements, Tex. 796.
- Chicken(s)—*see also* Chick(s), Cock(s), Cockerel(s), Fowl(s), Hens, Poultry, and Pullet(s).
- body louse, effect of phenothiazine, 74.
- broiler(s)—
- efficiency of feed utilization by breeds, 510.
 - production, cross-breeding for, Ark. 655.
 - starting and growing, use of mash developed by station, Ark. 655.
 - value of alfalfa leaf meal in rations, Ind. 227.
- carcass quality in roasters, physical measurements, 510.
- fried and roasted, flavor of, effect of corn, wheat, and barley in rations, 837.
- fryers and roasters, composition, effect of corn, wheat, and barley in diet, 802.
- head louse, effect of phenothiazine, 74.
- market grades, checking with meat measurements, 515.
- meat production in, Utah, 796.
- meat quality, methods of measuring, S.Dak. 802.
- viability, relation to railroad shipment, U.S.D.A. 747.
- Children—*see also* Girls and Infants.
- body measurements, regional relations, Tex. 886.
 - calcium metabolism experiments, 845.
 - calcium retention in, effect of lactose, 845.
 - dependent, in South Dakota, S.Dak. 692.
 - energy metabolism, effect of tea on, Tex. 886.
 - food allergy in, 843.

Children—Continued.

- food habits and physical condition, Me. 696.
 - gastrointestinal response, variation in, 548.
 - in Hawaii, hematologic values for, 551.
 - Mexican school, growth, Ariz. 122.
 - mineral and nitrogen metabolism, effect of fluid and of evaporated milk, 844.
 - nursery school, health and development, 548.
 - nutritional state in, estimation, 695.
 - obese, growth and development, 272.
 - preschool, caloric balances, effect of nitrogen in diet, 271.
 - preschool, retention of calcium and phosphorus, 552.
 - retention of calcium in diet, 845.
 - school, dark adaptation in, Ga. 122.
 - school, Oslo type meals for, 556.
 - training for self-reliance, Nebr. 575.
 - vitamin A deficiency in, cutaneous manifestations, 559.
- Chili wet rot due to *Othonephora cucurbitarum*, 200.
- Chilocorus cacti*, establishment of introduced species, P.R. 640.
- Chiloplasus trilineatus* n.sp., from diseased snapdragon cuttings, 70.
- Chinch bug(s)—
- false, notes, U.S.D.A. 784.
 - hairy, notes, Pa. 495.
 - populations in hibernation, U.S.D.A. 785.
 - resistance of sorghum hybrids to, Okla. 786.
 - resistance of sorghums, effect of fertilizers, 79.
 - studies, Ind. 212, U.S.D.A. 784.
- Chinchilla(s)—
- infectious disease of, 398.
 - raising in captivity, 213.
- Chinese families in Sungpan, dietary study, 271.
- Chionaspis fufura*, *see* Scurfy scale.
- Chipmunks, food habits, 782.
- Chlorella*—
- cells, growth-inhibiting substance produced by, 162.
 - effect of light of high intensity, 598.
 - significance of trace elements for, 595.
 - vulgaris, pigments produced in darkness by, 743.
- Chlorides in feeding stuffs, determination 731.
- Chlorine gas as seed disinfectant, U.S.D.A. 774.
- Chlorochroa*—
- Wata, notes, Tex. 787.
 - Say's, *see* Stinkbug, Say's.
- Chlorophyll—
- effect on activity of gonadotropic extracts, 459.
 - pigments and photosynthesis, Ind. 150.
 - preparations, criteria for purity of, 19.
- Chloropicrin—
- as promising nematocide, U.S.D.A. 768.
 - effect in overcoming influence of previous crops, R.I. 13.
 - to control soil pathogens, Tex. 770.

- Chloropids swarming in houses, 642.
 Chloroplasts, isolated, reduction of ferric
 ovalate by, 165.
 Chlorosis—
 and related mineral deficiency diseases
 of crops, Utah 771.
 due to magnesium deficiency, dolomitic
 limestone for control, [N.Y.] Cornell
 759.
 effect of lime in soil, Idaho 298.
 in grape, resistant varieties, tests, Colo.
 764.
 in grapes, trees, and shrubs, control by
 iron sulfate, U.S.D.A. 768.
 in Japanese azalea, 779.
 in lemons, Tex. 770.
 in pin oak, control, 780, N.J. 769.
 in roses and other plants, Tex. 771.
 in stone fruits, relation to calcium and
 potassium, Colo. 630.
 iron-deficiency, in sand cultures of *Derris*
 and fields of *Lonchocarpus*, P.R. 600.
Choanephora cucurbitarum, notes, 200.
 Chocolate milk drinks, suggested standards
 for, 523.
 Chokecherry—
 wild host of X disease, eradicating, 66.
 X disease, studies, 66, U.S.D.A. 59, 630,
 Utah 771.
 X-virus disease, first appearance in the
 State, R.I. 60.
 Cholera in ducks, value of chemically killed
 cultures for, 668.
 Choline for lactation and growth of rats,
 essential nature, 421.
 Christmas trees, black spruce, retarding
 needle fall on, 626.
 Chromosome(s)—
 and gene theory and cytology, 456.
 and genes, Cold Spring Harbor sympo-
 sium on, 862.
 complement, relation to cold resistance
 in plants, 604.
 in fowls, location of genes in [N.Y.]
 Cornell 747.
 number, effect of colchicine treatments
 and use in plant breeding, U.S.D.A.
 751.
 number in *Desmodium* and *Lespedeza*, 28.
 number in *Solanum* species in Buenos
 Aires area, 313.
 number in wild beans, 28.
 satellited and nucleoli, 745.
 Chrysanthemum(s)—
 diseases, control, 853.
 early-flowering, testing, Okla. 757.
 flower bud formation in, relation to tem-
 perature, 194.
 foliar nematode on, Conn.[New Haven]
 480.
 greenhouse, new varieties for cut-flower
 production, 720.
 requirements for soilless culture, Ohio
 765.
 root failure due to meadow nematode,
 Tex. 771.
 Verticillium disease in greenhouse, [N.
 Y.] Cornell 769.
Chrysobothris femorata, see Apple tree borer,
 flatheaded.
Chrysomphalus—
 aonidium, see Red scale, Florida.
 aurantii, see Red scale, California.
Chrysotus chlanoflava n.sp., description, 221.
 Cicada, periodical—
 broods scheduled to appear in 1937,
 U.S.D.A. 785.
 notes, 217, U.S.D.A. 493.
Cicadula divisa, see Leafhopper, six-spotted.
 Cigarette beetle, U.S.D.A. 784.
Cimex lectularius, see Bedbug(s).
 Cinchona, culture, P.R. 618.
Cinnamomum burmanni, culture, P.R. 618.
Cintractia—
 leuoderma, germination of chlamydo-
 spores, 23.
 species in flora of Argentina, supplement,
 772.
Cirphis unipuncta, see Armyworm.
 Citric acid, endogenous production, effect of
 diet, 126.
 Citrin occurrence in milk, 853.
 Citronella oil for protection of lambs against
 blowfly strike, 248.
 Citrulline, ability to replace arginine in diet
 of chick, 94.
 Citrus—
 aphids on, 363.
 byproduct wastes, disposal, U.S.D.A. 733.
 cold resistance in, due to varieties and
 other factors, 336.
 cultural practices, quarter century
 changes in, 335.
 dictyospermum scale infesting, 791.
 disease involving death of fibrous roots,
 210.
 diseases, control, Tex. 770.
 diseases in Uruguay, 635.
 diseases, symptoms, in Jamaica, and con-
 trol, 635.
 dry root rot, Ariz. 59.
 felt disease in São Paulo, cause of, 636.
 fertilization, Ariz. 44.
 fertilizer requirements, Ariz. 13.
 fruit(s)—see also Lemon(s), Orange(s),
 etc.
 development, effect of girdling, Tex.
 758.
 development of color in, 476.
 products, U.S.D.A. 725.
 products, commercial manufactur-
 ing methods, U.S.D.A. 782.
 respiration and color development,
 effect of emanations from several
 species of fungi, 23.
 vitamin C in, effect of nutrient de-
 ficiencies, U.S.D.A. 756.
 volatile products of, identification
 of acetaldehyde among, 193.
 wraps containing o-phenylphenol
 for, 778.
 genus, host-parasite check-list revision,
 U.S.D.A. 768.
 groves, plant bugs in, 646.

Citrus—Continued.

- groves, protection from low-temperature injury, Ariz. 44.
 growth, relation to pH, 336.
 hybrids, rootstocks for, and fruit seed content, 337.
 industry and California Fruit Growers Exchange system, U.S.D.A. 832.
 insects, control with oil emulsions, Ala. 73.
 insects, fall clean up, 78.
 insects, relation to cover crops, 495.
 leaves, oil spray residue on, determination, 644.
 leprosis, 636.
 melanose control, Fla. 486.
 mineral deficiency and excess symptoms, nutritional relations, 352.
 nitrogen assimilation, 623.
 nutrition, nitrate concentration and ion balance in, Calif. 54.
 orchard reclamation, Tex. 757.
 peel, dried, and pulp in ration of dairy cows, Tex. 806.
 pests, effect of cold wave in Florida, January 1940, 789.
 propagation and progeny tests, Tex. 758.
 rust mite, effect of sulfur on, U.S.D.A. 783.
 rust mite, notes, Tex. 787.
 scale insects, Tex. 787.
 seed development, effect of pollination 623.
Septoria spot disease, 636.
 stems, xylem anatomy, relative water conductivity, and transport of dyes, 169.
 thrips control, 362.
 thrips damage on Chinese photinia, 645.
 thrips in Florida, 645, 790.
 thrips, insecticide studies on, U.S.D.A. 783.
 trees, N assimilation by, Ariz. 44.
 trees, own-rooted and budded, growth, 54.
 wound protectants, Tex. 758.
Ottotoma spp. in rabbits, 73.
Otiatosporium sp., on apple angular leaf spot, 635.
Otiotoma oklahomensis, new, from a hawk, 783.
Otiadras to *Oornus*, host-parasite checklist revision, U.S.D.A. 768.
 Clams, analyses, Me. 694.
 Clarite, use for sealing glycerin mounts, 454.
 Clay—
 fraction, studies, Idaho 298.
 Houston black, infiltration and its measurement in, 588.
 hydrogen, base binding capacities, 737.
 minerals, montmorillonite type of, qualitative color test for, 293.
 sorption by, 299.
 Clemson College, notes, 720.
Otiocendron infortunatum leaves, proteolytic enzymes of, 446.

Climate—see also Meteorology.

- and acclimatization, treatise, 12.
 and insect control, N.J. 786.
 and weather of Connecticut, 12.
 climax, and vegetational strata, 734.
 geographic-complex method for study, 441.
 of Juan Vinas region, Costa Rica, 587.
 of Montevideo, normals for, 154.
 of the South, 296.
 recorder, micro-, description, 296.
 Climatic—
 chronology, in some coast redwoods, 296.
 conditions in different localities, method of comparing, 295.
 factor, farmer's consideration of, 734.
 Climatological—
 data, R.I. 13, U.S.D.A. 12, 153, 442, 734.
 diagram, the hythergraph, application to distribution of natural vegetation types, 296.
 summary for State College, Pa. 575.
Otiostomum campanulatum, occurrence, 641.
Otiocybe tabescens, pure cultures, infection with, 631.
Otiolina rugithorax injury to corn and ripe strawberries, 652.
Otiostidium—
 chauvoet aggressin, studies with, 104.
 madisoni, effective in butyl alcohol fermentation of molasses, Wis. 582.
 welehii infection, treatment with sulapyridine, 102.
 Clothes moths—
 fumigation for, [N.Y.] Cornell 786.
 lures and traps to control, 79.
 resistance of treated textile fabrics to, test for, 650.
 studies, U.S.D.A. 784.
 Clover
 alsike, sweetclover ring spot from, 58.
 aphid, notes, Mont. 785.
 bur, seed germination, boiling-water treatment as aid, 470.
 bur, variety tests, Tex. 752.
 effect of nurse crops with, Idaho 319.
 establishment and survival on native pasture, effect of fertilizers, Tex. 758.
 fall-planted, value for pasture, hay, and seed, Miss. 319.
 for pasture in Florida, Fla. 613.
 in rotations, response to fertilizers, Ind. 179.
 Ladino, adaptation, Ga. 34.
 Ladino, vitamin A value, Idaho 372.
 leafhopper, ability to transmit potato yellow-dwarf virus, hereditary variation in, 627.
 red—
 alfalfa, and sweetclover as hay crops, comparison, Ind. 178.
 breeding, Pa. 464.
 breeding for adaptation in, 178.
 breeding in Finland, 321.
 hay phosphorus, availability to white rats, 657.

Clover—Continued.

red—continued.

inheritance studies, Pa. 464.

pubescent characteristic as related to determination of seed origin, 470.

root development in Sassafras loam, 37.

seed, origin, ineffectiveness of seed treatments to reveal, 470.

seed viability in, farm demonstrations as measure, 470.

selection and inbreeding in, 321.

variety tests, N.J. 751.

root borer, notes, Mont. 785.

seed as carrier of many disease fungi, U.S.D.A. 788.

seed midge, notes, Mont. 785.

seed, prices, data, Wis. 682.

species, carotene content, 89.

strawberry, adaptation for wet locations, Utah 613.

strawberry, experiments with, Utah 753.

variety tests, Tex. 752.

white, breeding, U.S.D.A. 751.

winter pasture, as nitrogen source for summer grass, Ga. 34.

Cloves, culture, P.R. 618.

Olysta ambigua—

action of sex scent in, 788

intestine contents, pH and buffering power, 788.

Coal-mining population, rural, sickness and medical care among, Ark. 121.

Coast disease of sheep and cattle in Western Australia, 91.

Cobalt requirement in dogs on milk diet, 801.

Coccarboxylase in blood, index of vitamin B₁ deficiency, 704.

Coccidae on coconuts in Seychelles, control, 791.

Coccidial infection, avian, initiation with merozoites, 398, 532.

Coccidiosis—

artificially produced, effect of four grades of sulfur on, 106.

experimental avian, effect of sulapyridine on, 398.

experimentally produced, flowers of sulfur and charcoal for control, 510, 532.

in domesticated animals and fowls, 106.

in lambs and dogs, Colo. 668.

in lambs, source and availability of infective oocysts, 673.

in laying flock, 533.

prevention and cure with aqueous colloidal sulfur solution, 533.

Oocoidomenus niloticus n.sp., parasite of black scale, Calif. 791.

Coccids on roots of plants in Egypt, 647.

Coccinellid beetles, predators of scale insects, P.R. 640.

Coccophagus spp., parasitic in black scale, Calif. 791.

Oochlomyia americana, see Screwworm.

Cockerels, dubbed and normal, hormone study, 462.

Cockroach(es)—

American, effect of pH on toxicity of nicotine injected into, 498.

American, life history, 790.

American, penetration of insecticides through pronotum, N.H. 360.

American, toxicity of yellow phosphorus to, 498.

brown-banded, life history and habits, 358.

German, effect of household insecticides on oothecae of, 498.

German, life cycle without vitamin A, 498.

German, relative susceptibility of ootheca and adult female to liquid insecticides, 77.

German, toxicity of yellow phosphorus to, 498.

hemocytes, mitotic response to pathogenes in hemolymph, 217.

six species inhabiting buildings, biology, Ind. 361.

studies, Ind. 212.

Cocks, blood calcium, and fat and bone formation, effect of oestrogen administration, 510.

Coconut(s)—

composition of shell, 727.

immature nut fall, agent responsible, 701.

scale, shipment of predatory beetles to Florida and Hawaii against, P.R. 640.

Codling moth(s)—

baits, fermented by *Aerobacter* and *Aerobacillus*, attractiveness, 649.

bands, studies, 781.

bibliography, U.S.D.A. 493.

control, 75, 359, 367, Idaho 357, Ind. 212.

N.Y.State 642, Pa. 495, U.S.D.A. 783.

control, calcium arsenate and lead arsenate sprays with soybean flour for, 649.

control, development of an effective program for, Vt. 185.

control, effect of road dust on, 367.

control, status of organic insecticides for, 649.

control with electric traps, Ind. 254

in southwestern Quebec, life history, 502.

larvae on pear trees, spur-burrowing habit, 367.

on stone fruits in California, 642.

problem intensified, Ark. 648.

situation, 74.

sprays, results with, 366.

studies, Mont. 786, N.J. 788.

v. ants, W.Va. 787.

Cod-liver oil as substitute for green grass for calves, Miss. 89.

Oenurus serialis in rabbits, 73.

Coffea arabica, root system, growth and distribution in Catalina clay, P.R. 764.

Coffee—

diseases and pests, 200.

prices in Puerto Rico, 1900-1938, P.R. 265.

shade trees, attack of crown gall on, 201.

- Coffee—Continued.
 tree, bacteria and fungi of, 487.
 tree necrosis, 210, 778.
 tree wound or pruning disease, 67.
 varieties, Columbian and West Indian, comparison, P.R. 618.
- Colchicine—
 induced tetraploids of dioecious and monoecious species of *Amaranthaceae*, 605.
 polyploidy and technic, 744.
 treatment to obtain polyploid forms of plants, N.Y.State 617.
 value in potato improvement, N.J. 751
- Cold storage lockers, expanding use, Utah 141.
- Coleophora*—
inaequalis, rearing, liberation, and recovery, P.R. 640.
malivorella, see Pistol casebearer.
- Coleus*
 leaves, effect of growth substances on absciss layer in, 446.
 permanent wilting in, initial water-supplying power of soils at onset of, 16.
- Coli* bacilli and coli phages in milk, 240.
- Cohas eurythema*, biology and control, La. 357.
- Coliform bacteria—
 detection, sodium lauryl sulfate lactose tryptose broth as primary medium, 245.
 in swimming pool water, 745.
- Collards, breeding, Ga. 44.
- College students, ascorbic acid metabolism of, 424, Idaho 412.
- Colletotrichum*—
destructivum, loss of sporulation in, 627.
gloeosporioides, latent infections caused by, 481.
gloeosporioides on persimmon, control, 211.
graminicolum, new cause of foot disease in cereals, 773.
- Colloidal gels, state of water in, 546.
- Colloids—
 amphoteric, salt effect on, 588.
 soil, behavior, laws of, 155.
- Colocasia antiquorum (esculenta)*, wet rot of leaves of, 200.
- Colorado College, notes, 576, 719.
- Colorado Station, notes, 576, 719.
- Colorado Station, report, 718.
- Colostrum from cows, vitamin A and carotene in, 519.
- Columbidae, cellular characters in, species and hybrids, interrelations, 314.
- Combines—
 economy of, Ind. 256.
 studies, Ind. 254.
- Commodity—
 Credit Corporation rates, 1940-41, Okla. 402.
 Exchange Administration, report of chief, U.S.D.A. 686.
- Community—see also Rural community (ies).
 open-country southern, life in, 690.
 reorganization studies, Idaho 402.
- Comparators, Lovibond color, two types, 730.
- Conditions, new, demand new opportunities, U.S.D.A. 687.
- Conenose, bloodsucking, virus isolated from, Kans. 674.
- Conidiobolus villosus*, relation to mushroom diseases, control, Pa. 480.
- Coniferous—
 plantations, snow damage to, Mich. 626.
 plantations, topsoil changes in, 198.
 seed testing, germination and seed quality, N.Y.State 477.
- Conifers—
 in Lake States, weevils attacking bases and roots, control, U.S.D.A. 493.
 vegetative propagation, 767.
- Conjunctivitis of fowls and an associated *Rickettsia*-like organism, 814.
- Connecticut—
 [New Haven] Station, report, 575.
 State Station, notes, 288.
 Storrs Station, notes, 576.
 University, notes, 576.
- Conoderus* sp., in Florida Everglades, 228.
- Conopia exitiosa*, see Peach borer.
- Conotrachelus nenuphar*, see Plum curculio.
- Conservation—
 challenge of, U.S.D.A. 687.
 teaching in elementary schools, 268.
- Consumer—
 expenditures, 1935-36, in United States, 574.
 purchases, studies, Vt. 286.
- Contarinia*—
daotyldis attacking seed heads of cocksfoot, 221.
juniperina, pest of red cedars, 220.
mali, notes, 221.
merceti, seed production in, gall midges affecting, 792.
- Cooperation—see also Marketing, cooperative.
 American, treatise, 663.
 Belgian rural, a study in social adjustment, treatise, 262.
 in farm woodland management, 409.
 role in solving farmers' troubles, 835.
- Cooperative(s)—
 associations, farm-city, growth of, U.S. D.A. 687.
 farm and forest, 256.
 farmers', periodicals issued by, 265.
 farmers' selling and purchasing, in Tennessee, Tenn. 264.
 grain marketing by local warehouses and elevators in Northwest, U.S.D.A. 541.
 marketing, see Marketing.
 movement, responsibility of Extension Service to, 402.
 movement, responsibility of land-grant colleges to, 402.
 purchasing of farm supplies, W.Va. 683.

Cooperative(s)—Continued.

selling and service associations in Southwest, types and evaluation of service, 401.

supply business in Southwest, status, 401.

types, financed in Region VI of Farm Security Administration, 401.

Cooperia—

cuticoid in sheep and anthelmintics against, 818

cuticoid, phenothiazine as anthelmintic for, 396.

species, chromosomal determinations, Tex. 757.

Copepod, parasitic, cause of death of goldfish, P.R. 640.

Copper—

and iron in butter, determination, 151.

and iron v. liver in treatment of hemorrhagic anemia in dogs, 276.

boron, and manganese simultaneously determined in mixed fertilizers, 730.

colorimetric microdetermination, 151.

compounds and mixtures, toxicity to fowls, 252

compounds, fixed, for vegetable disease control, 347.

different forms in sprays and dusts, effect on muskmelons, 204.

effect on milk flavor, 508.

fungicide tests on tomato, 628.

fungicides, adhesiveness, relation to safety, N.J. 769.

fungicides, solubility, effect of supplements on, 628.

in commercial fertilizers, 308.

in tomatoes, 731.

minute quantities, stimulation of yeast growth by, Wis. 582.

nitrate solutions, rate and mode of penetration, 43.

poisoning tests with domesticated birds, 676.

resinate as treatment for paper pots, 472.

sprays for control of walnut blight, 487.

zinc, sulfur, and calcium, studies, 532.

Copra insect pests in Guam, 358.

Corn—

and oats, relative labor requirements for, Ga. 110.

and sorghum, comparison, and effects on succeeding grain crops, Tex. 753.

and sorghum in alternate rows, S.Dak. 752.

anthers, failure of cytokinesis in during microsporogenesis, 171.

bacterial wilt, corn flea beetle as vector, U.S.D.A. 784.

bacterial wilt of dent variety, 627.

borer, European—

abundance in 1938 and 1939, U.S.D.A. 785.

capturing moths of, U.S.D.A. 823.

Corn—Continued.

borer, European—continued.

control by electric light traps, 219, Ind. 212.

control, effect of mechanical husker in, 82.

differential susceptibility to among corn strains, 361.

estimates of damage by, U.S.D.A. 785.

insecticides for control, N.Y.State 642.

parasite, receipt for trial against sugarcane borer, P.R. 640

parasites, field status, U.S.D.A. 785.

parasites, liberations in 1937, U.S.D.A. 785.

studies, Conn.[New Haven] 494, N.J. 786, U.S.D.A. 784.

breeding, Ariz. 33, Colo 612, Conn.[New Haven] 464, Ind. 178, Mont. 612, N.J. 751, [N.Y.] Cornell 751, Okla. 752, P.R. 613, S.Dak. 752, Tex. 752, U.S.D.A. 751, W.Va. 754.

breeding of improved selfed lines, 26.

charcoal rot, Okla. 770.

comparison of red clover, alfalfa, and sweetclover in rotations with, Ind. 179.

culture experiments, Ark. 38, Mont. 612, Okla. 752, S.Dak. 752, Tex. 753.

cutting demonstrations, low, Ind. 254.

damaged by specific fungi, impairment in nutritive value, 507.

dent, new kernel blemish in, Ind. 200.

diseases in Virginia, U.S.D.A. 199.

diseases, seed-borne, problems of, N.Y. State 202.

divergent meiotic spindle formation in, cytogenetic studies, 312.

double crosses of early and late inbred lines, effect of method of combining, 604.

draft on soil nitrogen and its replacement, Okla. 752.

ear rot in Indiana, Ind. 200.

ear rots in 1939, U.S.D.A. 842.

earworm—

biology, 650.

control, P.R. 640, Tenn. 792.

control, use of oil or oil containing pyrethrins for, U.S.D.A. 493.

differential injury within varieties, inbred lines, and hybrids, 501.

hibernation in Washington State, 642.

moth in Virginia, seasonal abundance of eggs, 649.

on tomato, flight habits and control, Calif. 792.

studies, Ind. 212, N.J. 786, U.S.D.A. 784.

varietal resistance to, Okla. 786.

effect of lime as supplement to fertilizer, Ga. 34.

effect of preceding crop, 320.

Corn—Continued.

embryos, excised, development in an atmosphere of nitrogen, 16.
 endosperms, hormone content, 17.
Euchlaena, and *Tripsacum*, genetic and cytological relations, Tex. 753.
 fertilizer experiments, Tex. 753.
 flea beetle as vector of Stewart's disease of corn, U.S.D.A. 784.
 futures, trading, relation to price movements, 255.
 genetics, Conn.[New Haven] 471.
 growth and differentiation, relation to nitrogen supply, 164.
 Golden Cross Bantam, stocks, variability in viability and uniformity of plants, N.Y.State 618.
 high protein strain, development, S.Dak. 752.
 hybrid(s)—
 and its parents, growth substances in, 596.
 demonstrations, results, 319.
 development and widespread use, U.S.D.A. 751.
 differential susceptibility to corn leaf aphid, 80.
 expansion of production and use, U.S.D.A. 751.
 in Ohio, historical notes, Ohio 754.
 new of Minnesota Station, 719.
 resistant to insects, development, U.S.D.A. 751.
 seed, grading for planting, 466.
 seed growers aid in evaluating, Ohio 38.
 in different forms for winter-finishing baby beeves, comparison, Tenn. 230.
 in lamb fattening ration, Okla. 795.
 in rotations, response to fertilizers, Ind. 179.
 inbred lines, value in hybrid combinations, 27.
 inheritance studies, Tex. 753.
 insect damage, tight cribs and carbon bisulfide to curb, Miss. 361.
 insect pests in Guam, 358.
 irrigation tests, Tex. 753.
 leaf aphid, differential susceptibility to among corn strains, 80, 361.
 lines, yellow and white, new outstanding strains, Ark. 612.
 meal, white, and Sussex ground oats, comparative net energy for fattening cockerels, 282.
 moldy, poisoning in horses, 319.
 nitrogen and potash carriers, Tex. 753.
 Ohio-packed, quality and retail prices, 269.
 planter with three seed hoppers, [N.Y.] Cornell 826.
 planting on contours v. up and down slopes, N.J. 751.
 plants, use for supporting pole bean ~~var.~~, N.Y.State 618.
 plowing under heavy applications of cyanamide for, Ind. 179.

Corn—Continued.

prices, Chicago, relation to trading and daily price changes, 255.
 production from late plantings, Ind. 179.
 production in Colorado, Colo. 613.
 resistance to migratory grasshopper, 645.
 response to potash and phosphate, Ga. 33.
 response to sweetclover as green manure, W.Va. 754.
 role in development of civilization of the Americas, bibliography, U.S.D.A. 257.
 roots, excised, synthesis of thiamin by, 304.
 rootworm, notes, U.S.D.A. 784.
 rootworm, southern, control, Ga. 74.
 seed, drying, Ind. 254.
 seedlings grown in nutrient solution with and without nitrogen, features of, 17.
 siamensis character in, 601.
 silage, *see* Silage.
 silk beetle, studies, La. 357.
 silk fly, control, P.R. 640.
 sirup, high conversion, use in making jelly, jam, and fruit butter, 547.
 smut, cultural characters, effects of pH, 632.
 spacing experiments, 614.
 stalk rot, effect of barrenness and defoliation on, Ind. 200.
 standing, sowing cover crops in, N.J. 751.
 starch from different varieties and types, 840.
 sterility in regional forms, in Argentina, 604.
 Stewart's disease, *see* Corn bacterial wilt.
 strain susceptibility to European cornborer and corn-leaf aphid, 361.
 sweet, *see* Sweet corn.
 telocentric chromosome in, and stability of its centromere, 312.
 tetraploid, chromosome number and behavior in fertile and sterile lines, [N.Y.]Cornell 751.
 translocations in, involving chromosome 3, 453.
 v. wheat for hogs, Ga. 80.
 value, in dry farming program, Mont. 612.
 varieties and hybrids, comparison, Ariz. 33.
 varieties, forage yields, Tex. 753.
 variety-spacing test, Tex. 753.
 variety tests, Ark. 38, Ga. 33, Idaho 319, Ind. 178, N.Dak. 180, N.J. 751, Okla. 752, P.R. 613, Pa. 464, R.I. 84, S.Dak. 752, Tex. 752, Utah 753, W.Va. 754.
 variety tests, analysis of lattice and triple lattice experiments, Iowa 466.
 wheat and barley, comparison in diet of chickens, 802.
 yield, effect of lime, manure, and commercial fertilizers, Ind. 179.

Corn—Continued.

yield increase from phosphate applications, Pa. 442.

Cornell University, notes, 142.

Cornstalk borer, lesser—
notes, Tex. 787.

susceptibility of annual teosinte to, P.R. 640.

Cornstalks, methods of disposing, effect on soil fertility, Ind. 179.

Coryne luteum—

extracts, effect on young male rats, 610.
formation and maintenance in rats, relation to oestrogenic hormone, 317.
functional, production in rabbits before and after transection of hypophyseal stalk, 609.

Corticium rolfsii, notes, 346.

Corticium sasakii, notes, 346.

Corynebacterium equi in bovine pyometra, 527.

Corynebacterium equi, possible cause of tuberculous-like lesions of swine, 530.

Corynella brasiliensis on *Podocarpus* leaves, 637.

Coryneum leaf spot of peach, Idaho 342.

Corynosoma constrictum, new hosts and new locality, 535.

Corythauma new genus, erection, 499.

Coryza, infectious, of fowls, vaccination with avian mixed bacterin, 398.

Coryza, infectious, studies, B.I. 101.

Cost of production, see *specific crops*.

Cotton—

age of plants, relation to susceptibility to field inoculation of root rot, Tex. 770.

angular leaf spot—

in Argentina, etiological agent, 484.
seed treatment for, Ariz. 59.
wind dissemination, 627.

anthracnose boll rot, relation to *Bacterium malvacearum*, 629.

boll rot diseases, survey, and micro-organisms causing, U.S.D.A. 342.

bolts set, increase caused by naphthalene acetic acid sprays, Okla. 752.

breeding, Ariz. 33, Ga. 22, Okla. 752, Tex. 752, U.S.D.A. 751.

breeding, use of hormone treated cuttings and special type grafts in, 177.

burs as fertilizer for cotton, Okla. 735.
calcium arsenate dusting, and its effect, 494.

chemistry and growth, relation to soil fertility and root rot, 348.

culture experiments, Tex. 753.

cytogenetics, Tex. 753.

damping-off, control by seed treatment with sodium hypochlorite, 484.

diseases and pests, 200.

diseases in Texas in 1939, U.S.D.A. 342.

diseases of seedlings and bolls, fungi associated with, 774.

effect of ringing on upward movement of solutes from root, 450.

experiments, Ariz. 33.

Cotton—Continued.

farms, change in labor organization on, Ark. 113.

farms, displacement of families on, Ark. 688.

farms, types, cash returns, labor requirements, etc., Ga. 110.

fertilizer experiments, 612, Tex. 753.

fertilizers, cotton burs v. manure as, Tex. 753.

fertilizers, profit from \$100 spent for, Miss. 325.

fiber(s)—

and minor seed hairs, classification and description, 570.

chemical identification, 717.

developing, identification and estimation of reducing sugars in, 25.

maturity and length, factors affecting, Ariz. 33.

pectic substance of, relation to growth, 181, 451.

surface characteristics, 855.

flea hopper—

control, La. 357.

infestations, hibernation, and control, Tex. 787.

insecticides for, tests, 78.

notes, Okla. 788, U.S.D.A. 784.

flowers, chemical fertilization, Okla. 752.

Fusarium wilt, Tex. 770.

Fusarium wilt, relation to meadow nematode, U.S.D.A. 489.

ginning and packing, U.S.D.A. 823.

gins, types, costs and profits, Tex. 828.

grades and staple lengths of 1938 and 1939 crops, in different areas, Ga. 110.

harvesting, mechanical, Tex. 823.

hosiery, finishing treatments applied to, 572.

hosiery, water repellency of, 578.

improvement in one-variety communities, U.S.D.A. 751.

inheritance studies, Tex. 753.

insects, U.S.D.A. 784.

insects in Arizona, control, U.S.D.A. 493.

irrigation tests, Tex. 753.

leaf and root aphids, U.S.D.A. 784.

leaf aphid and bollweevil control, combination of insecticides for, 494.

leaf worm in Western Hemisphere, 649.

leaf worm, lead arsenic and calcium arsenate in control, 219.

linters, selected references, U.S.D.A. 543.

loans to farmers, Okla. 402.

mineral uptake, effect of ringing and of transpiration on, 449.

need for trace elements and T. V. A. phosphates, Ga. 33.

new outstanding strains, Ark. 612.

nitrogen and potash carriers, Tex. 753.

nutrition experiments in greenhouse, factorial design in, Ark. 34.

nutrition research on ammonium v. nitrate nitrogen, Ga. 33.

nutritional deficiency symptoms in, 347.

one-variety communities, economic aspects, Tenn. 33.

Cotton—Continued.

physical characteristics, interrelation, Tex. 855.
 polyhalite as source of potassium for, Tex. 753.
 prices and local marketing practices of North Carolina, N.C. 684.
 production and exports, in south Brazil, U.S.D.A. 685.
 production in the United States, 257.
 pulp, new uses, 295.
 Research Congress, papers, 324.
 response to potash and phosphate, G. 1. 33.
 root knot nematodes, U.S.D.A. 489.
 moting substances, Tex. 733.
 root knot, control under irrigation, crop rotation v. fallowing, U.S.D.A. 489.
 root knot nematodes, U.S.D.A. 489.
 root rot, relation to fertilizers, crop residues, and tillage, 347.
 root rot, susceptibility of seedlings to, 484.
 roots, new nematode species parasitic on, Ga. 60.
 sea island, field test of timed poisoning schedules for bollweevil, 494.
 seed, *see* Cottonseed.
 seedling disease as aid to better stands, Okla. 770.
 seedling disease committee, seed treatment research by, 342.
 sources of phosphate for, with ammonium sulfate as nitrogen carrier, Ga. 34.
 stamp plans for distribution of surpluses, U.S.D.A. 542.
 thrips, studies, Tex. 787.
 topping studies, Tex. 753.
 upland, sparse lint, naked seeds, and other characters, genetic relations, Ark. 746.
 varieties, Ala. 33.
 varieties adapted to mechanical harvesting, development, Tex. 753.
 varieties, differential growth rates and response to seasonal conditions, U.S. D.A. 181.
 variety tests, Ga. 33, 614, Okla. 752, Tex. 752.
 water economy, relation to excessive shedding of squares and immature bolls, Tex. 770.
 wilt and rust, status of studies on control, Ark. 680.
 wilt checked by introduction of resistant varieties, Okla. 770.
 wilt control, U.S.D.A. 768, 769.
 wilt, development in wilt-resistant and wilt-susceptible variety, effect of N-P-K ratio in fertilizer, 341.
 wilt development, relation to potash treatments, 341.
 wilt in Texas, U.S.D.A. 342.
 wilt organism, inoculating soil with, methods, Ala. 63.
 wilt, relation to nematode species, 63, Ga. 60.

Cotton—Continued.

wilt resistance of new strains and hybrids, 775.
 yield and fiber length, effect of spacing, Tex. 753.
 yield and wilt, effect of potash, Ga. 60.
 yield, effect of different combinations of phosphate and lime, Ga. 33.
 yield, relation to fertilizers, crop residues, and tillage, 347.
 yield, relation to plant and fiber characters, Ga. 33.
 Cottonseed—
 allergens, studies, U.S.D.A. 725.
 and fertilizer, efficiency in distribution and placement, Tex. 823.
 anthracnose-infested, delinting and treating, Ga. 60.
 as source of new type flour, 325.
 cake, hardness tests for, Tex. 057.
 crushing industry, technology, 325.
 delinting and germination of delinted seed, Ariz. 33.
 dusting for control of seedling infection by soil *Rhizoctonia*, 348.
 gravity graded, field results with, 178.
 meal as source of carbohydrates in dairy ration, Okla. 806.
 meal, digestibility, for lambs, Okla. 705.
 meal, effect on yolk color, Okla. 802.
 meal, iodine in, Tex. 727.
 meal, iron-treated, for steer calves, Ohio 90.
 meal v. soybean meal, 373, Ark. 655, Ind. 226.
 methods of treating and planting in south Louisiana, effect, 178.
 molasses beet pulp pellets, feeding value for wintering beef cattle, Mont. 655.
 oil, hydrogenated, nutritive properties and digestibility, U.S.D.A. 837.
 oil, old and new uses, 324.
 storage tests, 177.
 tests for disease organisms, 760.
 treatment, cost repaid by higher yields, Okla. 770.
 treatment for planting purposes, Tex. 823.
 varieties, composition, Tex. 753.
 Country, *see* Rural.
 County funds available and expenditures for certain purposes, Tex. 828.
 Cover crops for citrus orchards, cost and yield of varieties, 332.
 Cover glasses, plastic as substitute for, 18.
 Cow(s)—*see also* Cattle and Heifer(s).
 acid-base balance in, effect of phosphoric acid dilage, 384.
 age, live weight, and milk-energy yield in Illinois, 385.
 all-roughage v. roughage and limited grain feeding, U.S.D.A. 662.
 artificial insemination of, Vt. 235.
 bloated, types and amounts of gases in rumen, S.Dak. 806.
 born twin with bull, which produced five calves, 173.

Cow(s)—Continued.

- breeding, applications of reproduction physiology to, 814.
- breeding, value of peanut hay for wintering, Ala. 88.
- dairy, cull apples for, Va. 235.
- dairy, full-feeding, economy of, Pa. 517.
- dairy, vitamin A requirements, Ind. 234.
- dairy, vitamin D requirements, S.Dak. 806.
- dairy, wastage, length of productive life, replacement, and depreciation in England, 384.
- effect of plane of nutrition on calf crop, Mont. 656.
- fasting metabolism of, 373.
- feeding roughage and concentrates to, profitableness of different amounts, R.I. 110.
- inbred Ayrshire herd, persistency in, 517.
- milk production, *see* Milk production.
- milking, effect of adding bone meal and lime to rations, Tex. 806.
- milking, prairie hay v. alfalfa for, Okla. 806.
- sterile and normal, reaction of vaginal mucus, [N.Y.]Cornell 747.
- sterile, failure of gonadotropic hormones to increase fertility, [N.Y.]Cornell 747.
- udders, *see* Udders.

Cowpea(s)—

- Abyssinian, studies, P.R. 613.
- breeding, Tex. 753.
- curculio, control, Ga. 74.
- curculio, host plants and parasites, 494.
- seed pods, Curculionidae, Bruchidae, Lepidoptera, and their parasites infesting, 643.
- seedlings, cell size in growing region of primary root, relation to vitamin C, 18.
- seedlings, cellular changes and dry matter in growing region of primary root, 18.
- variety tests, Ga. 33.
- virus mosaics, control, Okla. 770.
- Crab apple seedlings, germination and growth, effect of fungicidal treatment, 49.
- Crab meat, canned Atlantic, a new American food, 837.
- Crabgrass bonitateilus*, pest of bluegrass and bentgrass lawns, 647.
- Crabgrass sperryellus*, pest of bluegrass and bentgrass lawns, 647.
- Cranberry (ies)—
 - bogs, late holding of water on, N.J. 621.
 - culture, Mass. 334.
 - false blossom, leafhopper causing, control, 495.
 - fruit rots in New Jersey, N.J. 635.
 - harvesting, N.J. 761.
 - rootworm as apple pest, N.Y.State 86.
 - seedlings, decapitated, origin of adventitious shoots, 19.
 - weevil, N.J. 738.
- Crapemyrtle mildew, control, Tex. 770.

Crassula rubicunda, flower production in, by low temperature and light, 16.

Cream—

- and Butter Association, Challenge, of Los Angeles, operating methods, U.S. D.A. 832.
- changes in demand in New York metropolitan area, [N.Y.]Cornell 827.
- cooked flavor in, factors responsible, Pa. 517.
- cooling, storage, and transportation, Nebr. 886.
- dealers' sales in New York market, analysis [N.Y.]Cornell 263.
- deterioration on farm, reducing, Okla. 806.
- Devonshire or clotted, preservation, application of frozen pack method to, 242.
- Federal inspection, requires farm care, Miss. 141.
- for buttermaking, neutralization, Mich. 687.
- frozen, keeping quality, value of pasteurization in improving, Pa. 517.
- holding for churning in dairy plant, S.Dak. 806.
- keeping quality, effect of salt, 667.
- lipolytic activity in, 239.
- market, factors affecting body of, Vt. 235.
- market, measuring sanitary quality, 810.
- neutralization, 98.
- neutralized, detection, new method for, [Conn.]Storrs 295.
- neutralizing agents, Okla. 806.
- pasteurization, vacuumator process for buttermaking, 522, Oreg. 387.
- pasteurized, application of resazurin test to, 810.
- pasteurized, hemolytic organism isolated from, 521.
- pH value, effect of different neutralizers, Mich. 667.
- returns secured by producer, factors affecting, Ind. 235.
- samples, analyses, Ma. 694.
- sweet and sour farm-skimmed, enzymes in, Ind. 235.
- viscosity, methods of determining, Wis. 664.
- Creamery (ies)—
 - butterfat losses in, method for determining, 667.
 - milk delivered to, quality-improvement program for, Idaho 883.
- Creatine metabolism in muscular dystrophy, due to vitamin E deficiency and treatment, 284.
- Creatinine standard, new, for basal metabolism and its clinical application, 278.
- Cricket—
 - four-spotted tree, egg parasites of, 505.
 - Mormon, control by poisoned bait, U.S.D.A. 361.
 - Mormon, control programs, Mont. 785.
 - Mormon, notes, U.S.D.A. 784, Utah 787.
 - sand, notes, Okla. 786.

- Oriconemoides sphaerocephalum* on cotton roots, 70.
- Oronartium*—
comptoniae, notes, 637.
ribicola—see also White pine blister rust.
 and *O. occidentale*, temperature as factor in distinguishing, 627.
- Crop(s)—see also Forage crops and specific kinds.
 and weather, 12.
 charcoal rot, Okla. 770.
 costs of Illinois, twenty-five years of, Ill. 116.
 dry matter in, relation to hay and silage making, Ohio 797.
 effect on soil acidity, R.I. 13.
 effect on succeeding crops, R.I. 34.
 feed, improving quality and economy of production, [N.Y.]Cornell 751.
 feed, 100 lb. of digestible nutrients and butterfat production per acre, man, horse, and machine-hours required in, Utah 806.
 greenhouse, causes of poor growth, N.J. 765.
 greenhouse, effect of different concentrations of salts and alkalies in water applied to, Okla. 757.
 greenhouse, soilless culture for, advantages, N.J. 765.
 harvesting with livestock in South, 226.
 improvement by breeding, U.S.D.A. 756.
 improvement, permanent, [N.Y.]Cornell 769.
 improvement, unexplored avenues of, 469.
 in rotation, fertilizer and liming tests, W.Va. 754.
 in rotation, fertilizer experiments, Tex. 753.
 insurance, U.S.D.A. 687.
 insurance, an experiment in farm income stabilization, 261.
 intensive, costs and returns on, Ind. 256.
 judging, training for, Miss. 545.
 lands, abandoned, revegetation, and measurement of grazing capacity, Colo. 612.
 of muck and sandy soil, production and marketing, Ind. 185.
 on muck soils, adaptation and soil management, [N.Y.]Cornell 759.
 protecting from waterfowl damage by reflectors and revolving beacons, 213.
 relative changes in purchasing power, 1800 to 1939, S.Dak. 828.
 reports, U.S.D.A. 118, 266, 544, 686.
 residues, decomposition, difference in rate, S.Dak. 735.
 returns on different soils, Ind. 256.
 rotations, see Rotation of crops.
 sequence studies, 320.
 soil-depleting, decrease in, Ohio 736.
 southern, returns from use of fertilizers on, 177.
 yield index numbers, 681.
- Crop(s)—Continued.
 yields, effect of depth of plowing, S.Dak. 179.
 yields, effect of fertilizers, Utah 735.
- Crotalaria*—
 for soil improvement in South, U.S.D.A. 751.
 variety tests, Tex. 752.
- Orotalaria spectabilis* strains, intermediate in maturity, development, Ala. 33.
- Crown gall—
 control on rose cuttings, Tex. 770.
 due to *Phytoplasma tumefaciens*, relation to insects, 201.
 growth substance in, factors affecting, 629.
 notes, 480.
 organism, carbon metabolism, factors affecting, 772.
 organism, micrurgical studies, 628.
 organism persistent in grain land, U.S.D.A. 769.
- Crows, of Oklahoma, winter banding, 356.
- Crucifer clubroot—
 control, [N.Y.]Cornell 769.
 development, effect of mineral nutrients, 483.
- Crucifers, infection of seedlings by *Alternaria* spp. and *Rhizopus nigricans*, effect of treatments, 470, 480.
- Cryolite as an insecticide, La. 357.
- Cryptaspidiotus shasta*, notes, 75.
- Cryptognatha nodiceps*—
 establishment as scale predator, P.R. 640.
 shipment to Florida and Hawaii for liberation against coconut scale, P.R. 640.
- Cryptolaemus montrouzieri* for mealybug control in greenhouses, Mass. 500.
- Otenocephalides canis*, see Dog flea.
- Otenocephalides felis*, see Cat flea.
- Cuckoos, North American, life history, 73.
- Cucumber beetle(s)—
 and aphids, transmission of cucurbit viruses by, comparison, 627.
 control studies, 353.
 striped, insecticide tests against, 494.
 striped, notes, Mont. 786.
 studies, Ind. 212.
 western spotted, transmission of cucurbit viruses by, 789.
 western striped, transmission of cucurbit viruses by, 789.
- Cucumber(s)—
 breeding for disease resistance, Conn. [New Haven] 471, [N.Y.]Cornell 769.
 diseases in Indiana, 347.
 downy mildew, new copper compounds for, Conn.[New Haven] 480.
 Midgett, new dwarf variety for pickling, 719.
 mosaic virus, comparative host ranges, 344.
 seedless fruits from varieties, 617.
 variety tests, Pa. 472.

Cucurbit—

diseases, caused by *Phytophthora capsici*, 347.

insects, insecticide tests with, Colo. 642.
mosaic virus, comparative host ranges, 344.

powdery and downy mildews, in New York, U.S.D.A. 342.

viruses, transmission by cucumber beetles and by aphids, 627, 789.

Culture media—

sterile, automatic zero pipette for dispensing, 603.

sterilizing solutions of organic compounds used in, methods, 771.

Culture of people of a Puerto Rican town, 690.

Culture, southern, recent studies of, 688.

Cuprous oxide and inert ingredients, compatibility, 627.

Curculio spray, special, comparison of adhesives for, Conn.[New Haven] 495.

Curculionidae and parasites infesting seed pods of cowpea and wild plants, 643.

Curd, edible, water and dry matter in, 546.
Ovinus sp., predator of scale insects, P.R. 640.

Curly top virus strains, 58, 627.

Currant—

black, flower midge, in Finland, 221.

black, magnesium deficiency in, 777.

diseases, N.Y.State 630.

leaf spots, control, 66.

Cuscutaria lunata, notes, Tex. 770.

Cuscuta and its host, auxin in, 16.

Cuterebra buccata, notes, 221.

Cuterebra cuniculi, notes, 221.

Cut-over land—

cost of clearing, Idaho 319.

recent settlement on, economic and sociological study, Idaho 402.

Cutworm(s)—

biology and control, N.J. 786.

on velvet bentgrass, control, R.I. 75.

Pale western, Mont. 786, U.S.D.A. 784, Utah 787.

studies, Ind. 212.

Oycas revoluta shoot apex, zonal structure and growth, 311.

Oyclocephala immaculata as test insect, 74.

Oylas formicarius, see Sweetpotato weevil.

Oylindrocopturus longulus, U.S.D.A. 784.

Oyphella villosa, notes, 631.

Cypress, rare rust of, 779.

Cyrtacanthacrinae of South China, taxonomic and biological studies, 645.

Cysticerous—

crassicolis, resistance against, relation to sex factors, 526.

pliformis in rabbits, 78.

Cytology, plant, paraffin method in, 744.

Dactylanthus taylori, distribution, habit, and habitat, 201.

Dactylaria haplospora n.sp., description and parasitic relations, 212.

Dactylella doedyoides n.sp., description and parasitic relations, 212.

Dactylopius tomentosus, notes, 217.

Dacus ferrugineus and variety *dorsalis* in North West India, 789.

Dahlia smut, notes, U.S.D.A. 342.

Dahlia variety test, Ga. 765.

Dathinia brevipes, notes, Okla. 786.

Dairy—

and hog farming in northeastern Iowa, Iowa 404.

barn, experimental, Ind. 254.

barns, efficiency of various materials for, Vt. 235.

byproducts, new industrial and food uses, U.S.D.A. 668.

byproducts, utilization, U.S.D.A. 805.

byproducts, utilization in ice cream, U.S.D.A. 668.

cattle and dairy cows, see Cattle and Cows.

chemistry, progress in, 517.

enterprise in northeastern Iowa, Iowa 829.

equipment, action of wetting agents in wash waters, 812.

equipment, sterilization, ultraviolet lamps for, N.J. 805.

equipment, washing, use of compressed air in, Idaho 899.

farmers of New Zealand, standards of living, 267.

farms, electric water heaters for, Ind. 255.

farms in Kentwood area, economic study, La. 403.

farms in Ogden milkshed area, Utah 828.

feeds, mixed, mineral matter in, 226.

herd(s)—

breeding efficiency, age as factor, 808.

effect of continuous use of sires transmitting high level of productive inheritance, Mont. 662.

handling, man-labor requirement for, U.S.D.A. 662.

hygiene, initiation of program, N.J. 813.

improvement, N.Y.State 663, U.S. D.A. 805.

incomes, effect of efficient feeding on, Wis. 682.

judging, training for, Miss. 545.

products—

consumer's expenditures for, 265.

cooperative marketing, 542.

effect of homogenization, Pa. 517.

marketing, Okla. 827.

sanitary quality, checking, 238.

solid, application of burr-smear culture technic to, 240.

sulfur in, 127.

research at Reading, progress in, 235.

sires, see Bull(s) and Sire(s).

utensils, yeast and mold on, agar slice method for detection, 521.

Dairying—see also Creamery(ies), Butter, Milk, etc.

- Dairying—Continued.
place, in Mississippi agriculture, Miss. 872, 403.
- Dallis grass—
time and method of seeding, Ga. 34.
variations in, 177.
- Damping-off—
control of tomato, Tex. 770.
of ornamental seedlings, control, [N.Y.] Cornell 769.
- Dandelions in lawns, control with kerosene, Mont. 612.
- Daphne cneorum* dieback, R.I. 60.
- Daphne, Rose, fertilization, R.I. 44.
- Dark adaptation—
and vitamin A deficiency, 279, 556.
basic principles, 557.
individual differences in, factors producing, 278.
new photometer for measuring rate, 128.
relation of diet to rate and extent, 129.
- Dasyneura*—
daetylidis attacking seed heads of cocksfoot, 221.
leguminicola, see Clover seed midge.
ribis, notes, 221.
- Dasyneura parvipennis*, parasite of thrips, shipment to Florida, P.R. 640.
- Date(s)—
fruit rot, control by spraying, Ariz. 59.
maturity and storage, factors affecting, Ariz. 44.
palm decline disease, 480.
palm, *Graphiola* leaf spot of, Ariz. 59.
palm, propagation, Tex. 758.
- Datura stramonium* plants from colchicine-treated seed, chromosomal deficiencies, 747.
- Davenport, Eugene, pioneer and prophet, editorial, 721.
- Deer—
browse, increasing, 782.
food, quality of winter browse for, Pa. 495.
food, winter, monthly variations in nutritive value, 491.
populations, study, by use of pellet-group counts, 491, 495.
raising in captivity, 213.
white-tailed, digestive capacities, 782.
- Delphastus* n.sp., description, 228.
- Delphax striatella*, carrier of new grain mosaic disease (zakuklvanie), 203, 646.
- Democracy—
in agriculture, why and how?, U.S.D.A. 687.
preservation of, and public information U.S.D.A. 687.
- Dendroctonus*—
brevicornis, see Pine beetle, western.
frontalis, see Pine beetle, southern.
ponderosae, see Black Hills beetle.
- Dendrothele alba* n.sp., description, 160.
- Dermatitis—
in chickens distinct from pantothenic acid deficiency, 808.
of rat, relation to pantothenic acid, 851.
- Dermatitis—Continued.
pigeon, a vitamin B deficiency state with anemia, 234.
- Dermeids injurious in dwelling houses, [N.Y.] Cornell 786.
- Deserts—
effect of exhausting food reserves from, P.R. 600.
elliptica, propagation, culture, and root development, P.R. 618.
spp., toxicity tests, P.R. 640.
- Desert shrubs common to North and South America, floristic significance, 24.
- Desmodium*, cytological investigations in, 28.
- Desserts, frozen, dextrose and corn sirup for, N.Y. State 812.
- Deuterophoma tracheiphila*, notes, 778.
- Devil's shoestring—
as insecticide, N.J. 780, Tex. 787.
cultivated, changes in insecticidal value of roots at different stages of growth, 244.
testing for insecticidal value, U.S.D.A. 758.
- Dewberries, culture and disease control, Ill. 53.
- Dexliidae species, parasitic on Japanese beetles, U.S.D.A. 503.
- Diabetes, vitamin A deficiency in, 854.
- Diabetic children, analytic study of development, 854.
- Diabrotica*—
duodecimpunctata, see Corn rootworm, southern.
color, see Cucumber beetle, western spotted.
trivittata, see Cucumber beetle, western striped.
vittata, see Cucumber beetle, striped.
- Diadromus collaris*, notes, 225.
- Dialeurodes chittendeni*, notes, 216.
- Diamondback moth—
as pest of cultivated crucifers, 78.
parasites, host selection by, 225.
- Diaphania hyalinata*, see Melonworm.
- Diaphania nitidalis*, see Pickleworm.
- Diathermy, studies, Idaho 389.
- Diathetes pandanae*, new Fijian, injurious to *Pandanus*, 505.
- Diatraea saccharalis*, see Sugarcane borer.
- Dichlorobenzene, p-, as vapor fumigant, 203.
- Dictionary of plant names and botanical terms, 740.
- Dictyocaulus filaria* in sheep, treatment, 814.
- Dictyospermum scale infesting citrus, 791.
- Diet(s)—see also Food and Nutrition.
and resistance to tuberculosis, 855.
deficiency diseases—see specific diseases.
deficient, skeletal abnormalities in offspring of rats reared on, 461.
during lactation and pregnancy, 695.
identical, effect of technique on composition values, 271.
lignin, cellulose, and hemicellulose content, effect of changes in food intakes on, 559.

Diet(s)—Continued.

- modified Goldberger, multiple deficiencies in, 803.
 - of adolescent girls, 555.
 - of Australian schoolboys, 548.
 - of children, *see* Children.
 - of different sections of India, urinary excretion of vitamin B; by subjects on, 131.
 - of infants, *see* Infants.
 - optimal and marginal, composition, 694.
 - pellagra-producing, of Goldberger, multiple deficiencies of, Wis. 693.
 - relation to health, 128.
 - special, cost of, 841.
- Dietaries of Chinese and Mohammedan families, 271.
- Digestion experiments, accuracy of, 796.
- Digestive disturbances, functional, effect of vitamin B complex and constituents, 702.
- Digitalis*, flower production in, by low temperature and light, 16.
- Dill, plant development and yield, effect of spacing, Mich. 194.
- Dinitro-o-cresol dust for grasshopper control, 645.
- Dinoderus minutus*, bamboo species susceptible to, test, P.R. 640.
- Diphenylamine for removal of intestinal nematodes from dogs, 532.
- Diphtheria, calf, sulfapyridine in treatment, 528.
- Diplocarpon rosae*, relative susceptibility of rose varieties to, U.S.D.A. 630.
- Diplocladium* spp., relation to mushroom diseases, control, Pa. 480.
- Diplodia*—
- macrospora*, carbohydrate requirements, 741.
 - seae* damaged corn, effect on nutritive value, 507.
 - seae*, development in corn pith following stalk inoculations, 629.
 - seae*, inhibitor produced by, Iowa 343.
 - seae*, sclerospore-producing strains, in United States, 845.
 - seae*, survival in digestive tract of cattle, 772.
- Diplogynia americana* from eastern little green heron, 103.
- Diplotaxis sordida* in Saratoga Forest Tree Nursery, 651.
- Diprion polytomum*, *see* Spruce sawfly, European.
- Dipterous larvae and wound treatment, 85.
- Dirhinus giffardii*, shipment to Dominican Republic, P.R. 640.
- Dirofilaria immitis*, fleas as intermediate hosts, 106.
- Discomycetes, Georgia, notes, 23.
- Diseased subjects, vitamin A requirement, 279.
- Diseases—
- food-borne, control, Mass. 124.
 - of animals, *see* Animal diseases and specific diseases.

420530—41—6

Diseases—Continued.

- of metabolism and nutrition, review, 716.
 - of plants, *see* Plant diseases and specific host plants.
- Disinfectants, studies, U.S.D.A. 813.
- Distances, horizontal, simple method for determination, 478.
- Distillers' byproducts—
- use in poultry rations, 511.
 - vitamin content, 507.
- Distillery slop for hogs, Ky. 376.
- Distribution, problem, contribution of cooperation to, 681.
- Ditylenchus dipsaci* in narcissus plantings, in Oregon, U.S.D.A. 489.
- Diverainervus*—
- masakensis* n.sp., parasite of black scale, Calif. 791.
 - smithi* n.sp., parasite of black scale, Calif. 791.
- Dodder—
- on alfalfa, Ariz. 59.
 - on citrus, 636.
 - on tomatoes in coldframes, Tex. 770.
 - on valencia orange, 636.
 - transmission of viruses by parasitic activities, 628.
 - unusual severity in Virginia, U.S.D.A. 59.
- Dog(s)—
- economical rations for, 801.
 - evolutionary allometry in skeleton of, 606.
 - flea, distribution and hosts, 74.
 - heartworm, fleas as intermediate hosts, 106.
 - hematology of avitaminosis A in, 508.
 - identification by tattooing, 658.
 - inheritance of intelligence and temperament in, U.S.D.A. 747.
 - nutritive requirements, 801.
 - on milk diet, cobalt requirement, 801.
 - on milk diet, iron utilization by, 553.
 - removal of intestinal nematodes from, efficacy of diphenylamine, 532.
 - tick, American, virulent strains of Rocky Mountain spotted fever virus from, 525.
 - tick, brown, rotenone in low concentration for control, 655.
 - tick, brown, studies, 359.
 - tickicide and insecticide for, 655.
- Dogwood—
- club gall, 216.
 - leaf spot due to *Septoria cornicola*, U.S. D.A. 342.
 - sprouting, effect of season of cutting, 198.
- Dolichopodidae, new California, 792.
- Dolichopodidae, new midwestern, 221.
- Dolophus* sp., in Florida Everglades, 228.
- Dothiorella ulmi*, notes, U.S.D.A. 199.
- Dough, oven spring of, Mont. 612.
- Dough properties, behavior, 289.
- Doughnuts, fat absorption by, factors affecting, Iowa 413.

- Douglas fir twig weevil, U.S.D.A. 784.
- Doves, cellular characters in species and hybrids, interrelations, 314.
- Doves, Pearlynecks, ringdoves and backcross hybrids, differences in morphology of spermatozoa from, 29.
- Doyle's disease of fowls, viability of virus, 253.
- Drainage—
 areas, evaporation-loss per month from, 154.
 basins, selected, natural water loss in, 824.
 of land overlaying an artesian basin, Utah 678.
 studies, U.S.D.A. 823.
 work, expansion of, U.S.D.A. 823.
- Drakes, blood calcium, and fat and bone formation, effect of oestrogen administration, 510.
- Dresses, women's, buying guide, U.S.D.A. 429.
- Dried-fruit insects, cold storage for control, U.S.D.A. 783.
- Drinking water, warming for livestock, electric heat for, Ind. 254.
- Drought of 1939, Ariz. 11.
- Drug(s)—
 analyses, Me. 694.
 effect on ascorbic acid excretion, 427.
 plants, chemical constituents, function of polyploidy in, 171.
 plants, of Georgia, 740.
 products, inspection, Conn.[New Haven] 271.
- Drying from frozen state, inexpensive apparatus for, 602.
- Duck(s)—
 disease problems for raisers, 668.
 embryos, successful cultivation of *Plasmodium* spp. in, 258.
 inheritance of yellow bill color in, 457.
 Khaki-Campbell, characteristics and egg production, N.J. 805.
 laying, feeding experiment with steamed potatoes and swedes, 233.
 wild, *Acanthocephala* of, 535.
- Ducklings, vitamin D requirements, 510.
- Dust explosions and fires, agricultural, U.S.D.A. 823.
- Dust, recent electronmicroscope findings on, 430.
- Dusting tent, portable, 642.
- Duststorms, effect on migrations of desert locust, 788.
- Duty of water, *see* Irrigation.
- Dyes, feeding to laying hens, 95.
- Dystrophy, nutritional muscular, relation to vitamin E, U.S.D.A. 662.
- Harvas fabia*, pre-imaginal development and viability, 788.
- Earth, rammed, construction, S.Dak. 823.
- Earwig, notes, Mont. 786.
- Easter lily(ies)—
 breeding, U.S.D.A. 787.
 improvement, U.S.D.A. 756.
 seedlings, forcing, Ind. 185.
- Eaters, good and poor, among nursery school children, 549.
- Echidnophaga gallinacea*, *see* Sticktight flea.
- Ecological data, polygonal graphing of, 447.
- Ecology, enclosure technic in, 447.
- Economic almanac for 1940, 402.
- Economics with applications to agriculture, treatise, 681.
- Economist's contributions to theory of land classification, Mo. 829.
- Ecopantheria icasia*, notes, P.R. 680.
- Ecthyma contagiosum, a virus disorder of sheep, human infection with, 528.
- Education for rural life, U.S.D.A. 687.
- Elgrass—
 on North Carolina coast, recovery, U.S.D.A. 199.
 situation, fall 1940, 768.
- Egg(s)—
 albumin, *see* Albumin, egg.
 and egg products, U.S.D.A. 725.
 and tissues, vitamin A and riboflavin in, effect of rations of hen, 510.
 blood spots in, 511, U.S.D.A. 747.
 cold storage, development of mold on, control, Mich. 661.
 color deposit in, oil-soluble green best dye for tracing, Okla. 802.
 cooking quality, Colo. 692.
 fertility, effect of semen injections, 608.
 fresh and stored, behavior in cake baking, relation to physical measurements, 511.
 fresh laid, breed differences in thick albumin content, 510.
 fresh white-shelled, factors affecting candled and broken-out appearance, 511.
 hatchability, feeding for, La. 804.
 hatchability, relation to specific gravity, 510, 515.
 incubated, value and feeding methods for pigs, [N.Y.]Cornell 795.
 infertile, detection previous to incubation, Ala. 89.
 infertile, early detection, [N.Y.]Cornell 747.
 interior quality and hatchability, effect of feeding, 226.
 marketing and retailing in Indianapolis, Ind. 256.
 marketing procedures and prices, [N.Y.] Cornell 827.
 marketing research in North Central States, 510.
 mechanical refrigeration, Ind. 254.
 oil as source of vitamin A, Okla. 795.
 position in clutch, relation to shape, N.J. 794.
 premature expulsion, by hens injected with posterior pituitary substances, 510.
 preservation, 660.
 prices under various systems of procurement and sale, 510.
 production—*see also* Hens, laying.
 and hatchability, effect of feeding wheat germ oil to poultry, 512.
 breeding and feeding practices for, Utah 796.

Eggs(s)—Continued.

production—continued.

effect of artificial light, 511, Okla. 802.

effect of backcrossing and reciprocal crosses, Ariz. 89.

effect of rations and methods of feeding grain, W.Va. 798.

intensity, effect on infertility of eggs, 804.

kind of feed more important than management, Okla. 802.

of White Leghorns and Rhode Island Reds, seasonal variation in, 94.

quality, and composition, effect of thyroidectomy, 515.

relation to vitamins, mineral reserves, and body weight of hens, 512.

successful use of low-grade cereals for, S.Dak. 802.

quality during short holding periods, effect of high humidity, N.J. 661.

shape, inheritance, Pa. 507.

shape, volume, and shell thickness, of pheasants, chickens, and turkeys, percentage shell as function, 96.

size, genes for, transmitting ability in males, 510.

storage, changes in ovomucin during, 805.

treated with oestradiol benzoate, sexual development, 32.

unfertilized, incubated, physicochemical changes in, 382.

uterine, rate of plumping in an artificial uterine solution, 515.

weight, correlation in between mothers and daughters, 608.

weight, effect of date of hatch, 510.

yield performance records, longevity, economic and statistical significance, 511.

yolk changes during passage through isthmus portion of uterus and oviduct, 660.

yolk fat, effect of increasing starch in ration, 511.

yolk production rate, effect of pregnant mare serum, 510.

Eggplant(s)—

seedless fruits from varieties, 617.

wilt, control, N.J. 769.

yellows, vectors of, Tex. 787.

yellows, virus-induced, and insect transmission, Tex. 771.

yielding highly resistant strains, variety tests, R.I. 60.

Eggshell—

color, variation between white- and brown-egg breeds, [N.Y.]Cornell 747.

quality, factors affecting variations in, 96.

value in poultry feed, 660.

Egus platycephalus, predator of scale insects, P.R. 640.

Eimeria—*necatrix*—

and *E. tenella*, separation by merozoite infection technic, 398.

effect of sulfapyridine on, 399.

tenella—

and *E. necatrix*, separation by merozoite infection technic, 398.

control in fowl, aqueous colloidal sulfur in, 533.

effect of sulfapyridine on, 399.

effect on blood sugar of fowls, 106.

Elachertus n.sp., parasite of new leaf miner of *Tephrosia*, P.R. 640.

Elasmopalpus lignosellus, see Cornstalk borer, lesser.

Electric—

energy, use in brooding, Ind. 254.

fencing, advantages and dangers, Pa. 536.

light, for the farmstead, U.S.D.A. 140.

light, use in greenhouse, Ind. 185.

mixers, small, and mixer motors, Ind. 286.

motors for the farm, U.S.D.A. 826.

roasters, studies, Iowa 574, Va. 286.

Electrification, rural—

a field for social research, 692.

notes, U.S.D.A. 687.

progress in Idaho, Idaho, 826.

Elements, minor, requirements for plant growth, Ala. 13.

Elevators—

farmer owned, of Ohio, financial operations, 541.

small, operating costs and earnings, Okla. 827.

Elm(s)—

American, inoculated with *Ceratostomella ulmi*, apparent recovery, 488.

American, transmissible mosaic of, 629.

American, vascular invasion by *Ceratostomella ulmi*, 627.

bark beetle, notes, U.S.D.A. 784.

bark beetle, smaller European—

in uninfected elm wood carrying Dutch elm disease pathogen, [N. Y.]Cornell 504.

mating habits, 357.

notes, Conn.[New Haven] 494.

stored at different temperatures, isolation of *Ceratostomella ulmi* from, 870.

black spot fungus, 637.

Chinese, in Michigan, Mich. 196.

dieback caused by *Dothiorella ulmi*, prevalence, U.S.D.A. 199.

disease, Dutch—

control, 488, Conn.[New Haven] 480.

eradication, U.S.D.A. 768.

fungus prevalent in bark-beetle-infested elm wood, 629.

in Connecticut, 638.

new treatment to save infected trees, 638.

spread and balloon releases, 212.

studies, [N.Y.]Cornell 769, 786, U.S.D.A. 59.

- Elm(s)—Continued.
 disease, Dutch—continued.
 survival of fungus at low temperature, 779.
 transmitted by ambrosia beetle, 357.
 trunk sampling for, 779.
 leaf beetle—
 control, N.Y.State 642.
 new in Utah, Utah 651.
 parasite, biology, 642.
 parasites, 651.
 scale, brown, description and control, Okla. 365.
 species, susceptibility to *Ceratostomella ulmi*, 629.
 wood, uninfected, as source of bark beetle carrying Dutch elm disease pathogen, [N.Y.]Cornell 504.
- Emphyteusis in modern Greek law, 256.
- Empoasca*—
fabae, see Potato leafhopper.
fabalis on lima beans, P.R. 640.
maligna, see Apple leafhopper.
- Empusa weberi*, effect on larvae of *Raphidia ophiopsis*, 788.
- Encarsia formosa* as factor in control of greenhouse whitefly, Mich. 87.
- Encephalitis, tick-borne human, in U. S. S. R. and Siberia, 525.
- Encephalomalacia, nutritional, poultry disease apparently identical with, 821.
- Encephalomyelitis—
 avian, U.S.D.A. 813.
 equine—
 chick embryo vaccine, anaphylactic reactions following use, 250.
 host range, 249.
 in pheasants, N.J. 813.
 infectious, U.S.D.A. 813.
 notes, Mont. 668.
 prophylaxis in, 397.
 toxic substances produced by streptococci isolated from, 103.
 virus and vaccine, chick-embryo-propagated, antigenicity and preservation, 388.
 virus, eastern strain—
 birds and mosquitoes as hosts for, 250.
 pH stability, 531.
 properties, 531.
 virus in brain of ground squirrel, 250.
 virus isolated from, Kans. 674.
 virus protein, immunization with noninfectious formalin derivative of, 675.
 virus, purification and properties, 388.
 in horses, mules, and chicks, Ind. 243.
 primary, in goats associated with *Listeria* infection, 105.
 sporadic bovine, 528.
- Encephalopathy, nicotinic acid deficiency, case reports, 708.
- Encyrtus fuliginosus* n.sp., parasite of black scale, Calif. 791.
- Endive, vitamin C in, 135.
- Energy factors, methods of computation, Pa. 507.
- Engineering handbooks, preparation and distribution, U.S.D.A. 823.
- Entamoeba debilecti*, notes, 810.
- Enteritis—
 in sheep and swine, reaction to johnin, 819.
 necrotic, summary, Mich. 674.
- Enterotoxemia, infectious, of lambs, Tex. 813.
- Entomological—
 problems, 75.
 systematics, as practical problem, 74.
- Entomologists and agronomists, cooperation in plant breeding studies, 358.
- Entomology—see also Insect(s).
 introduction to, treatise, 74.
 preventive, development of research in, 358.
- Entomophthoraceae, studies, 788.
- Entomoscelis adonidis*, see Turnip beetle, red.
- Entomosporium maculatum*, overwintering in Louisiana, 629.
- Eutyloma dahliac*, notes, U.S.D.A. 342.
- Environment and heredity in animal production, 605.
- Enzymes—
 concerned in use of amino acids by bacteria, 603.
 research, U.S.D.A. 725.
- Eumenacanthus stamineus*, see Chicken body louse.
- Eperythrosom ovis*, transmission to blesbuck, 523.
- Eperythrozoonosis in cattle, 814.
- Ephedra sinica*, improvement and culture, S.Dak. 787.
- Ephestia*—
 clutella, see Tobacco moth.
 flukilella, see Raisin moth.
 kuehniella, see Flour moth, Mediterranean.
- Epicausta pennsylvanica*, see Blister beetle, black.
- Epilachna varivestris*, see Bean beetle, Mexican.
- Epitrix*—
 cucumeris, see Potato flea beetle.
 parvula, see Tobacco flea beetle.
- Eriophyes vaccinii*, a new pest, 74.
- Eriophyid studies, new species, 655.
- Eriosoma lanigerum*, see Apple aphid, woolly.
- Erosion, see Soil erosion.
- Ervinia carotovora*, cause of bacterial soft rot of potato, Fla. 485.
- Erynnia nitida*, biology, 642.
- Erysipelothrix* sp. infection among veterinary students, 391.
- Erythrina*—
 berteriana, use as vanilla-supporting trees, P.R. 618.
 spp., damage by *Terastia meticolosalis*, P.R. 639.
- Erythroneura comes*, see Grape leafhopper.

- Escherichia coli*—see also *Bacterium coli*.
 cation adsorption by, 455.
 growth, relation between food concentration and surface for, 312.
 in milk, destruction, effect of time and temperature of pasteurization, N.Y. State 809.
 soil micro-organisms antagonistic to, 525.
- Eskimo(s)—
 children, dietary and metabolic studies, 554.
 oral lactobacilli and caries among, effect of natural and refined sugars, 697.
 saliva of, biochemical studies, correlated with dental caries, 555.
- Esophageal worm of dog, 675.
- Esophagus and oral cavity of chicken, non-specific lesion of, 676.
- Ethyl alcohol, mobilization of vitamin A from its stores in tissues by, 702.
- Ethyl-mercury-chloride, atypical growth, abnormal mitosis, and polyploidy induced by, 744.
- Etiella zinckenella*, see Bean pod borer, lima.
- Eucalyptus citriodora*, essential oil studies, P.R. 582.
- Eucephalobus*—
oxyuroides, causing disease of tobacco roots, U.S.D.A. 59.
teres on narcissus bulb, 70.
- Eucharidae, oviposition habits, 793.
- Euchlaena*, corn, and *Tripsacum*, genetic and cytological relations, Tex. 753.
- Euderus lutea*, life history and morphology, 225.
- Eutheola rugiceps*, see Sugarcane beetle.
- Eufalka uncostata*, a fungus-eating beetle new to Puerto Rico, 357.
- Eugenia buxifolia*, essential oil studies, P.R. 582.
- Eugenol and geraniol mixtures, attractiveness to Japanese beetle, 357.
- Euparyphum melis* from snowshoe hare, 214.
- Eupelmus* sp., parasite of *Orohelimum*, 506.
- Eupelmus*—
allymii n.sp., parasite of four-spotted tree cricket, 505.
 n.sp., parasite of *Orohelimum*, 506.
urosomus, parasite of willow insects, 225.
- Eurostus hilleri* from grain stores in Great Britain, 361.
- Eurytus eurythema*, see Alfalfa caterpillar.
- Eurytoma* sp., parasite of four-spotted tree cricket, 505.
- Euscelis strigatus*, notes, N.J. 786.
- Eusimulium* spp. new to science, 221.
- Eutettix tenellus*, see Beet leafhopper.
- Eucanthellus* sp., parasite of black scale, Calif. 791.
- Euscelis stigmatus*, control, P.R. 640.
- Evaporation, loss by, from drainage areas, 154.
- Evarthrus sodalis*, feeding habits, 503.
- Evergreens—
 broad-leaf, effect of winter droughts, N.J. 765.
 crown gall tests on, 779.
- ewe(s)—see also Sheep.
 and lambs, gummer, feeding, S.Dak. 795.
 backcrossing, for wool and mutton, W. Va. 748.
 breeding, applications of reproduction physiology to, 314.
 breeding, need of legume hay in winter ration, Ind. 226.
 flushing, value, Okla. 795.
 induction of fertility in, by injection of pituitary extract, 609.
 nonleguminous roughage for, value of lime and protein supplements, Ind. 226.
 nonpregnant, nonlactating, ketone bodies, sugar, and calcium in blood of, 280.
 on cottonseed meal rations, absence of abortions among, Okla. 795.
 pregnant, improved rations for, S.Dak. 795.
- Exanthema, vesicular, of swine, 249.
- Excavator, truck, details of construction for, U.S.D.A. 679.
- Exenterus* parasites of pine-feeding sawflies, review, U.S.D.A. 87.
- Exercise, effect on growing rat in presence and absence of vitamin B, 849.
- Exhibits, selected list, U.S.D.A. 546.
- Experiment Station Record, scope and use, editorial, 438.
- Experiment station—see also specific stations.
 research for 1941 conditions, editorial, 577.
- Eye—
 condition, spectacted, in rats, 421.
 gnats as vectors of bovine mastitis, 394.
 lesions, relation to riboflavin deficiency in diet, 707.
- Fabric(s)—see also Textile(s).
 deterioration by micro-organisms, U.S.D.A. 855.
 flexibility and drape as measurable properties, 139.
- Factor—
 alcohol-precipitate, effect on chicks and hens, 514.
 B₆ of vitamin B complex, studies, 282.
 chick antidermatitis, in distillers' residues, 507.
 earth eluate, dietary essential for pigeons in yeast and liver, 282.
 B₈ of vitamin B complex, 848.
 filtrate, dietary essential for pigeons in yeast and liver, 282.
 B, growth factor required by chicks, 94.
 rat filtrate, multiple nature of, 700.
 S, growth factor required by chicks, 94.
 U identity, 95.
 W concentrates, highly purified, preparation, 421.
 W in distillers' residues, 507.
- Family(ies)—see also Farm families.
 housing and facilities, urban, village, and farm, U.S.D.A. 856.
 in different economic levels, vitamin A status of, 419.

Family(ies)—Continued.

- income and expenditures—
 - farm series, U.S.D.A. 717.
 - southeast region, U.S.D.A. 429.
 - urban and village series, U.S.D.A. 856.
- living in Robertson County, variations in, Ky. 117.
- living, levels of, and income, in South, 544.
- low-income city, effect of food stamp plan on diet of, U.S.D.A. 856.
- types residing on marginal and sub-marginal land, [N.Y.]Cornell 834.

Farm(s)—

- accounting, a proposed approach, 257.
- adjustments in Montana, graphic supplement, U.S.D.A. 406.
- animals, *see* Livestock and Animals.
- building requirements, determining, 407.
- buildings, studies, Ind. 256.
- credit, *see* Agricultural credit.
- Credit Administration, report, 537.
- crop enterprises, relation of tenancy and ownership to, Idaho 402.
- earnings in 1939 on different soil types, Tex. 828.
- electricity on, *see* Electric.
- enterprises, 256.
- equipment for conservation work, demonstration and instruction in use, U.S.D.A. 823.
- families—*see also* Families.
 - leisure use by, Miss. 429.
 - patterns of living of, U.S.D.A. 687.
 - proportion in rural areas classed as real farmers, Wis. 682.
 - relocation, selected references on, U.S.D.A. 119.
- homes, electric light for, U.S.D.A. 140.
- housing, status and needs, U.S.D.A. 856.
- identical, in Coastal Plain area, summary of returns on, N.C. 682.
- implements, rubber tires for, Ind. 254.
- income—

- cash, from different crops, livestock, and Government payments, Miss. 405.
- composition since Civil War, 117.
- gross, and indices of farm production and prices in United States, 1869-1937, U.S.D.A. 832.
- in Ohio, gross cash from sale of products and from Agricultural Adjustment Administration payments, 259.
- in Robertson County, variations in, Ky. 117.
- noncash, from livestock products consumed at home, percentages, Tex. 828.
- relation to production, Utah 828.
- relation to size of farm, Okla. 827.

kitchen, utensils for, Oreg. 140.

labor, *see* Agricultural labor.

Farm(s)—Continued.

land(s)—

- conservation, 412.
- tax-price ratio 1913 to 1938, trends, Tex. 828.
- transfer stamp tax, graduated, 407.
- use, effect of strip mining of coal, Ohio 827.
- woodland management, N.J. 760.
- lay-out planning, technic, Minn. 829.
- lease provisions, 256.
- leasing, effects of mechanization and Government benefit payments, Tex. 828.
- leasing systems, economic significance, Tex. 828.
- life, old ideals v. new ideas in, U.S.D.A. 686.
- loans, success of, factors affecting, Ill. 111.
- machinery, *see* Agricultural machinery.
- management—
 - and land classification, Mo. 829.
 - factors under varying price conditions, importance of, Ind. 404.
 - problems in era of change, U.S.D.A. 687.
 - research, Dr. Schultz on, 256.
 - research, procedures increasing usefulness, 681.
 - study of Livingston County, [N.Y.] Cornell 827.
- mortgage indebtedness and agricultural credit in State, Utah 828.
- organization and management in Colebrook area, N.H. 260.
- organization, types in Sanpete and Sevier Counties, Utah 828.
- organizations, national, trends in U.S. D.A. 687.
- outlook: Illinois 1941, 540.
- overcrowded, U.S.D.A. 687.
- peanut-cotton-hog, in a depression year, analysis, Va. 258.
- people, marginality among, 266.
- performance, in north central South Dakota, S.Dak. 114.
- population, mobility, 266.
- population movement in North Dakota, continuing, N.Dak. 267.
- power, economical, Ind. 256.
- power machinery, [N.Y.]Cornell 826.
- practices, profitable, in central Indiana, Ind. 256.
- prices and production in Kentucky, thirty years of, Ky. 117.
- prices of North Dakota, N.Dak. 287.
- problems of Canada, 545, 835.
- products, *see* Agricultural products.
- purchasers, effect of size of down payment, Wis. 682.
- purchasing, assets available to tenants for, Wis. 682.

Farm(s)—Continued.

real estate—

- assessments in Maryland, measuring inequalities, Md. 538.
- corporations owning, basic principles for control, 261.
- mortgage indebtedness of Montana, Mont. 538.

reorganization studies, Idaho 402.

Security Administration, Region VI,

- types of cooperatives financed in, 401.

Security Administration, report, U.S. D.A. 689.

structures research, U.S.D.A. 823.

success factor reports, State-summary, Mich. 682.

successful, in northwestern Indiana, Ind. 256.

sugarcane, social study of labor and tenancy, La. 119.

supplies, cooperative purchasing, U.S. D.A. 833, W.Va. 683.

surpluses used in school lunches, U.S. D.A. 271.

taxation, *see* Taxation and Taxes.

technology on, U.S.D.A. 402.

tenancy—*see also* Land tenancy and Land tenure.

- in the State, [N.Y.]Cornell 827.

- landlord-tenant relations of share-renters and sharecroppers, Tenn. 406.

- legal aspects of landlord-tenant relations, Okla. 406.

- rate of increase and association with types of farming, Okla. 834.

- reform, basic features inherent in, 261.

- research, sociological approach to, 692.

- studies, U.S.D.A. 687.

tenure improvement, landlord-tenant cooperation and leasing procedure, U.S.D.A. 406.

wastes, U.S.D.A. 725.

Webber demonstration, operation of, S.Dak. 829.

woodland cooperatives, in United States, 409.

Farmer(s)—

- American, a philosophy of life for, U.S.D.A. 687.

- changing world, U.S.D.A. 686.

- cooperative associations in State, map showing location, Idaho 402.

- cooperative experiments, Okla. 735.

- cooperative marketing and purchasing associations, in North Dakota, N.Dak. 118.

- gains through organization to, 835.

- helping to improve status, 401.

- in groupistic regime, 257.

- moving to towns and cities, Ark. 688.

- on Stillwater Creek watershed, characteristics, 690.

- schools of philosophy for, U.S.D.A. 687.

Farmer(s)—Continued.

- small, becoming feed conscious and livestock minded, 226.

- stake in greater industrial production, U.S.D.A. 686.

Farming—*see also* Agriculture.

- areas, types of, in Saskatchewan, 261.

- as an occupation, transmission of, 690, [N.Y.]Cornell 834.

- dairy, *see* Dairy farms.

- part-time, diversified and specialized, Utah 828.

- part-time, research, 255, 692.

- possibilities, in problem area of East Tennessee Valley, Tenn. 261.

- practices and wildlife in eastern Texas, Tex. 782.

- type of, areas, Utah 828.

- types in Maryland, Md. 403.

- types in Mississippi, U.S.D.A. 540.

- units, character, relation to land management, Ind. 259.

Fat(s)—*see also* Oil(s).

- chemical products from, U.S.D.A. 725.

- dynamic effects, Pa. 507.

- edible, measurement of spoilage, Pa. 507.

- in dairy ration, 226.

- metabolism and B vitamins, 709.

- metabolism in chicks, effect of anterior pituitary extract, 510.

- physical and chemical characteristics, relation to value for frying, Iowa 413.

- sulfur in, 127.

- utilization by chickens, Ind. 227.

- wholesale prices, in United States, index numbers, U.S.D.A. 543.

Fatty acids—

- and possible biochemical significance, fungistatic properties, 161.

- fungicidal properties against *Phymotrichum omnivorum*, 638.

Fauna, coleopterous and dipterous, of pastures, 788.

Feather-legged fly, parasite of southern green plant bug, 650.

Feathers—

- bird, pigment production, effect of X-rays, 749.

- development in pigeons, effect of thyroid secretions on character, 462.

- of fowls, regeneration, effect of X-rays on, 462.

- robin-colored, production on White Leghorn fowls by grafts, 462.

- White Leghorn, production of robin pigment in, by grafts of embryonic robin tissue, 462.

Feed mills, capacity, variations in, Pa. 536.

Feeding stuffs—

- chlorides in, determination, 731.

- control, effective, and microscopical analysis, 226.

- effect of extremely fine grinding, Okla. 795.

Feeding stuffs—Continued.

- inspection and analyses, Conn.[New Haven] 228, Ind. 228, Ky. 373, Mass. 798, Me. 798, N.H. 656, N.J. 656, R.I. 373, Tex. 656, Vt. 798.
- nature of *Eimeria nieschulsi*—growth-promoting potency, 524.
- stabilization of iodine in, 507.
- value of fiber in, Okla. 795.
- Fence posts—
- preservative treatment, Conn.[New Haven] 478.
- steel, galvanized v. painted, comparative tests, S.Dak. 823.
- Fencing—
- and wire, atmospheric exposure, Tex. 823.
- electric, advantages and dangers, Pa. 536.
- range, pasture, and field, procedure, U.S.D.A. 680.
- Fenugreek, production tests, Tex. 752.
- Fenusa* n.sp. on violet, 642.
- Fermentation products, U.S.D.A. 725.
- Ferns and related plants native to North Dakota, N.Dak. 477.
- Ferrets, synergism of human influenza and canine distemper viruses in, 243.
- Fertility, dietary requirements for, 420.
- Fertilizer(s)—
- acidulated, Ariz. 13.
- analyses, evaluation, elimination of differences in investment in, 177, 303.
- analysis, Ky. 15.
- and cottonseed, efficiency in distribution and placement, Tex. 823.
- application, National Joint Committee on, proceedings, 591.
- commercial, manganese, copper, and magnesium in, 303.
- distributing machinery, U.S.D.A. 823.
- distributor, improvised, Miss. 401.
- experiments, *see special crops*.
- for vegetables, Conn.[New Haven] 442.
- inspection and analyses, Conn.[New Haven] 592, Ind. 304, Mass. 740, Me. 740, S.C. 592, Tex. 445.
- liquid, superiority, N.J. 758.
- materials, hygroscopic, decreasing caking tendency, U.S.D.A. 734.
- methods of applying, 330, Tex. 753.
- mineral, effect on symbiotic nitrogen fixation, 455.
- mixed, trace elements in, spectroscopic analyses, 730.
- neutral v. acid, for Mississippi soils, Miss. 15, 302.
- non-acid-forming, increased use, Vt. 153.
- placement, N.Y.State 618.
- ratios, Conn.[New Haven] 442.
- salts, movement in soil, effect of placement, 591.
- studies, 582.
- Fescue, meadow, hay and seed yields, effect of ammonium sulfate on, Idaho 319.
- Festuca*—
- pratensis*, first record in Britain, 632.
- speciosa* in commerce, identification, 470.
- Féver therapy, effect on blood levels and urinary excretion of ascorbic acid, 137.
- Feverfew, requirements for soilless culture, Ohio 765.
- Fibricola cratera*, raccoon as new host for, 783.
- Ficus sycamorus* leaves, feeding value, 656.
- Field crops—*see also* Crop(s) and Forage crops.
- experiments, studies of artificial plats for, Tex. 735.
- Fig products, research, Tex. 725.
- Fig rootstocks, testing, Ariz. 44.
- Filbert—
- bacterial blight, control, 67, U.S.D.A. 768.
- bacteriosis pathogen compared with *Phytophthora juglandis*, 67.
- composition of shell, 727.
- worm damage in Northwest, 648.
- worm, distribution and parasites, U.S.D.A. 783.
- worm, new parasite of, 372.
- worm, notes, 648.
- Finance situation, local public, in Sheridan County, Montana, Mont. 262.
- Fir, Douglas—
- cut-over lands, wild animal damage to seed and seedlings on, U.S.D.A. 641.
- multiple seedlings of, 478.
- of Mesa Verde, compression wood and recent chronology in, 296.
- region of Northwest, forest resources of, U.S.D.A. 767.
- region, vegetative succession following logging in, 197.
- root rot caused by *Poria weirii*, 354.
- Fir needle blight, 779.
- Fir, Swiss, needle cast, 779.
- Fire ants causing damage to telephone equipment, 74.
- Fire(s)—
- forest, *see* Forest fires.
- insurance, cooperative farm, costs [N.Y.]Cornell 827.
- Firebrat—
- attack on rayon fabric, 216.
- baits, barium compounds as poisons in, 644.
- Fireweed, nectar concentration in, and relative humidity, 653.
- Firewood, *see* Wood, fuel.
- Fish—
- and other higher animals, position in economy of lakes, 595.
- effect of arsenic from mosquito-control dusts, 220.
- in Lake Carl Blackwell, Okla. 781.
- liver oils, bio-assay, Tex. 657.
- muscle, decomposition, detection, 730.
- Oregon, furunculosis in, 245.
- production in farm ponds, Ala. 73.
- products, sulfur in, 127.
- Fish meal, white, biological value, 798.
- Flax—
- adventitious buds of hypocotyl, differential inhibition of initiation and development, 16.

Flax—Continued.

as new cash crop for south Texas, Tex. 752.

Bison, mineral nutrition, 307.
breeding, Tex. 753.

culture experiments, Tex. 753.

fiber, processing, U.S.D.A. 823.

fibers, chemical identification, 717.

fields, annual weeds in, control, N.Dak. 471.

in California, history, Calif. 258.

pasmo, Tex. 770.

production in Georgia, Ga. 326.

resistant to freezing injury, development, U.S.D.A. 751.

Sclerotium rolfsii on, U.S.D.A. 342.

seeding test, Idaho 319.

soil sickness in North Dakota, 63.

stinkbug damage, Tex. 787.

variety, seeding, and fertilizer tests, Ga. 34.

variety tests, N.Dak. 180, Tex. 752.

Flaxseed—

Georgia- and Minnesota-grown, oil content and iodine number of, Ga. 34.
respiration, 744.

yields, relation to time of seeding, N.Dak. 180.

Flea(s)—see also special hosts.

beetles on tomato plants, control, R.I. 75.

hopper, garden, control, Tex. 787.

human, distribution and hosts, 74.

Flesh fly larvae, toxicity of sulfur and nitrogen compounds to, 650.

Flood(s)—

damages, indirect, U.S.D.A. 154.

hurricane, of September 1938, 586.

studies, 11.

waters, conservation, range improvement through, Mont. 254.

Floor finishes—

attractive, easy to clean, durable, Mich. 430.

best suited for household use, kinds and maintenance, R.I. 141.

wood, care and maintenance in the home, R.I. 857.

Flooring materials, sanitary and physiological aspects, 858.

Flora—see also Plant(s) and Vegetation.

of Pacific States, ferns to birthworts, illustrated, 594.

of Patuxent research refuge, 213.

of Roaring Plains, West Virginia, 741.

Floral morphology, caryophyllaceous flower, 593.

Florida Everglades project, work on, U.S.D.A. 823.

Florida Station, notes, 431.

Flour beetle—

broad-horned, Mont. 785.

confused, as intermediate host of poultry tapeworm, 223.

confused, duration of life, 793.

confused, effect of ether on toxicity of fumigants, 652.

Flour beetle—Continued.

confused, notes, Mont. 785.

red, as intermediate host of poultry tapeworm, 223.

Flour—see also Bread.

bleaching, detection, interpretation of new method for, 731.

moth, Mediterranean—
breeding in honey comb, 642.
notes, Mont. 786.

new type, cottonseed as source, 325

white, and vitamin B₁, 560.

Flower(s)—see also Plants, flowering, and Plants, ornamental.

beetle, soft-winged, Mont. 786.

cut, in cold storage rooms, ethylene injury to, 339.

cut, life of, effect of gaseous emanations from fruit, U.S.D.A. 757.

seed germination, 470.

seeds, tests, N.Y. State 624.

thrips, Florida, on citrus fruits, 645, 790.

thrips, notes, U.S.D.A. 784.

Fluff louse, effect of phenothiazine, 74

Fluorescence and photosynthesis, time course observed simultaneously, 25.

Fluorine—

in foods, Ariz. 121.

microquantities in aqueous systems, thorium nitrate titration of, 729.

Fly(ies)—

bloodsucking, new to science, 221.

house, see Housefly.

in manure, destruction, Okla. 786.

sprays, U.S.D.A. 784.

sprays for livestock, determining toxicity, 643.

white, see Whitefly.

Fodder crops, see Forage crops

Fog, causes and forecasting, 734.

Foliar diagnosis—

by electrolyzing leaf tissue, 595.

salient features of method, 166.

Follicular fluid of mare, oestrin content, relation to oestrous cycle, 610.

Fomes applanatus, notes, 351.*Fomes fomentarius*, biology, 628.

Food(s)—see also Diet.

allergy in children, 843.

analyses, Me. 694.

and public health, Mass. 124.

ascorbic acid in, Ga. 122.

assaying for nicotinic acid, method, Wis. 693.

buying, treatise, 694.

chemical composition, 123.

consumption habits of families in small cities, villages, and farms, U.S.D.A. 856.

consumption in urban Puerto Rico, P.R. 124.

distribution, costs, reducing, U.S.D.A. 687.

distribution in urban Puerto Rico, P.R. 124.

dried, nutritive value for dogs, Wis. 660.

Food(s)—Continued.

- for the family, treatise, 694.
- freezing methods, Ga. 122.
- frozen-pack, preserving dietetic value, 270.
- handling and packaging plants, methods of cleaning and sterilizing equipment, N.Y.State 125.
- in world at war, 885.
- inspection, treatise, 270.
- locker plants in State, location, size, rental, etc., Wis. 682.
- materials, nicotinic acid potency, 563.
- nutritive value, effect of quick freezing, 693.
- oxalic acid in, behavior and fate, 277.
- poisoning, control, Mass. 124.
- preferences of rachitic and normal rats, 567.
- preservation, U.S.D.A. 836.
- production in western Europe, 411.
- products, fruit use in, 584.
- products, inspection, Conn.[New Haven] 271.
- products, packaging, containers suitable for, N.Y.State 693.
- quality and palatability, U.S.D.A. 836.
- quick frozen, quality control, 547.
- stamp plan, economic analysis, U.S.D.A. 542.
- stamp plan, effect on diet of low-income city families, U.S.D.A. 856.
- sulfur in, 127.
- supply of Great Britain in peace and war, 835.
- supply of Puerto Rico, P.R. 835.
- surplus, utilization, U.S.D.A. 836.
- that aided blitzkrieg, 886.
- the Nation's, 1919, 288.
- thiamin in, effect of cooking, 706.
- utilization, vitamin B₁ and riboflavin in economy of, Ark. 703.
- variations in vitamin content, Tex. 836.
- vitamin A value of, Ariz. 121.
- vitamin B₁ content and mineral constituents, U.S.D.A. 836.
- vitamins in—*see also specific foods*. studies, 846.
- with alkaline balance, ash determinations, 730.

Forage(s)—

- crop pests, [N.Y.]Cornell 786.
- crops, composition, effect of ensiling, N.J. 807.
- crops, yield and phosphorus content, effect of phosphate fertilizers, Mont. 587.
- ensiling methods, U.S.D.A. 662.
- grasses, *see* Grasses.
- harvesters to speed up grass silage making, Wis. 678.
- home-grown, nutritional basis of artificial drying, 656.
- nutritive values, measured with laboratory animals, U.S.D.A. 794.
- plants, selenium in, S.Dak. 727.
- poisoning, *see* Livestock poisoning.
- Plants, poisonous, and *specific plants*.

Forage(s)—Continued.

- production, possibilities and limitations in use of irrigated land for, Nev. 464.
- range, nutritive value, Colo. 612.

Forest(s)—

- and forestry, social and economic aspects, U.S.D.A. 197.
- cover, effect on wind velocity, 12.
- entomology of Turkey, 788.
- fires, control, U.S.D.A. 766.
- fires, control, organization, planning, and equipment, U.S.D.A. 197.
- fires, soil temperatures during, effect on vegetation survival, 626.
- floors, from plantations of same age and environment, comparison, 339.
- growth in Adirondack region, relation to soil character, [N.Y.]Cornell 785.
- inflammability, effect of chemical attributes of vegetation, 56.
- insect survey for 1939, 405.
- insects, studies, Ind. 212.
- land taxation in Michigan, U.S.D.A. 539.
- lands, need of increased public ownership, U.S.D.A. 766.
- leaves, types, rate of decay, W.Va. 766.
- lysimeter studies, Conn.[New Haven] 442.
- management, 256.
- management and utilization, W.Va. 766.
- management, classification of lands for, Mo. 829.
- national, status and significance of private ownership, U.S.D.A. 766.
- nursery, soil fertility studies, Conn.[New Haven] 442.
- place in farm economy, U.S.D.A. 687.
- plantation, establishment, culture, and development, [N.Y.]Cornell 766.
- plantation survival, relation to soil type, aspect, and growing season, 706.
- planting stock, distribution, Conn.[New Haven] 478.
- products of Indiana, marketing, Ind. 196.
- products statistics, of Northwestern States, U.S.D.A. 480.
- program, aims of, U.S.D.A. 766.
- protection from fire and pests, U.S.D.A. 766.
- relation to national defense and general welfare, U.S.D.A. 766.
- resource conservation, U.S.D.A. 687.
- resources of North and South Carolina, U.S.D.A. 196.
- rural assessment of, U.S.D.A. 683.
- soil, infiltration capacity affected by litter, 340.
- trees, *see* Trees.
- types, growth rates, W.Va. 766.
- types, temporary, site factor variations and responses in, 625.
- Foresters, American, society of, historical summary, 478.
- Forestry—
 - mycorrhizal habit in relation to, 159.
 - North American, selected bibliography, U.S.D.A. 196.

Forestry—Continued.

- on private timberlands, U.S.D.A. 478.
- place in agriculture, U.S.D.A. 766.
- Forficula auricularia*, see Earwig, European.
- Foulbrood, American, U.S.D.A. 784.
- Fowl(s)—see also Chicken(s), Hen(s), Poultry, *etc.*
 - autopsy examinations, R.I. 101.
 - breast ridge in, new dominant character linked with pea comb, 457.
 - cholera and neoplasms, mortality, genetic resistance to, [N.Y.]Cornell 747.
 - cholera diagnosis, 532.
 - copper poisoning tests of, 676.
 - dysfunction of biliary system and hemorrhages in gizzard, 96.
 - effect of parathyroid preparation on blood calcium, 513.
 - effect of sulfur flour on intestinal cell development, Tex. 796.
 - esophagus and oral cavity, nonspecific lesion of, 676.
 - heart rate, 510.
 - infertility in, [N.Y.]Cornell 747.
 - Lephorn, high and low protein rations for, W.Va. 796.
 - lipid metabolism in, endocrine control, 32.
 - metabolism, 232.
 - new lethal mutation in, theoretical significance, 510.
 - paralysis, see Paralysis.
 - pink eye in, inheritance, 29.
 - pox and laryngotracheitis vaccination, 107.
 - pox immunity, studied by skin grafts on chorioallantois of chick embryo, 107.
 - pox immunization, Ill. 534.
 - reproduction in, relation to ♂ and ♀ hormones, [N.Y.]Cornell 747.
 - spermatogenic activity, diurnal variations in, 511.
- Fox(es)—
 - chastek paralysis of, prevention, Wis. 669.
 - deficiency disease of, 93.
 - encephalitis, cytology and effects of centrifugation on intranuclear inclusions, 820.
 - nutritive requirements for growth, fur production, and reproduction in, [N.Y.]Cornell 781.
 - red, parasites of, in Illinois, 641.
 - silver, metabolism studies, U.S.D.A. 794.
- Frankliniella*—
 - cephalica bispinosa* on citrus fruits, 645, 790.
 - tritici*, see Flower thrips.
- Freemartin, record-breaking, 173.
- Freeze, Florida, of 1940, semipopular analysis, 298.
- Freeze of 1940, injury to tropical and subtropical plants, 835.
- Freezing unit, dry-ice, for cutting frozen sections, 602.

Frost—

- penetration, studies, 297.
- resistance in plants, relation to physical state, 448.
- rings in fall fertilized McIntosh apple trees, N.H. 50.
- Fruit(s)—see also Orchard(s), Apple(s), Peach(es), *etc.*
 - acid canned, spoilage, 733.
 - affected with black-tip disease, pathological histology, 200.
 - and fruit products, U.S.D.A. 725.
 - and fruit products, dietary value, 546.
 - and vegetable market, Knoxville wholesale, buyers and buying problems, Tenn. 264.
 - and vegetable market, Knoxville wholesale, taxes and regulations, Tenn. 408.
 - at different stages of development, auxin content, 16.
 - auctions, small-lot country, operation, U.S.D.A. 832.
 - bramble, culture and disease control, Ill. 53.
 - breeding, S.Dak. 757, Tex. 757.
 - breeding farm of Minnesota, report, 760.
 - brown rot fungi in Britain, 201.
 - butter making, use of sweetose in, 547.
 - candied, making, a practical home industry, N.Y.State 152.
 - Chinese, dried, sugared, and salted, vitamin C in, 282.
 - citrus, see Citrus.
 - competitive, distribution in New York City by chain and independent retailers, [N.Y.]Cornell 827.
 - composition, effect of soils and fertilizers, 336.
 - culture experiments, Tex. 757.
 - decay, checking with ultraviolet lamps, 486.
 - diseases and pests in Kansas, control, Kans. 333.
 - diseases and spray practices, 351.
 - diseases on Chicago market in 1939, U.S.D.A. 342.
 - diseases on New York market, U.S.D.A. 199, 769.
 - effect of low-temperature injury, Ga. 44.
 - flavors, preparation, N.Y.State 693.
 - Florida, vitamin C in, effect of maturation and cold storage, 564.
 - fly and variety *dorsalis* in North West India, 789.
 - freezing preservation, Utah 836.
 - fresh, precooling in refrigerator cars, Ind. 254.
 - frozen-pack, importance of, 270.
 - frozen-pack, preservation of quality, 270.
 - frozen, use in ice cream manufacture, Utah 806.
 - fumigated with methyl bromide, total bromides on, 644.
 - grading and fast freezing, Ind. 185.
 - Growers Exchange, California, system and citrus industry, U.S.D.A. 832.

Fruit(s)—Continued.

- improvement and outstanding seedlings, 760.
- insect pests in Guam, 358.
- insect pests in Massachusetts, survey, 78.
- keeping quality, effect of controlled atmospheres, [N.Y.]Cornell 761.
- marketing, [N.Y.]Cornell 827.
- marketing, cost of operating farm motor-trucks in, [N.Y.]Cornell 827.
- material, acetocarmine method for staining, 454.
- moth, oriental—
 - control by mechanical means, 792.
 - control, value of mass liberations of parasites, U.S.D.A. 783.
 - new peach pest in Louisiana, La. 357.
 - on peach, biological control, N.Y. State 642.
 - on quinces, control with arsenicals, N.Y.State 642.
 - parasites, importation, rearing, and colonization, U.S.D.A. 88.
 - parasites in Japan and Chosen, introduction into United States, U.S.D.A. 502.
 - relation of parasites to control, 78.
 - studies, 359, Conn.[New Haven] 495, Ind. 212, U.S.D.A. 784.
- new, development by breeding, N.Y. State, 618.
- new varieties, for Utah gardens, Utah 620.
- plants, subtropical, distribution of auxin in, 17.
- plants, transplanted, effect of vitamin B₁ on, N.Y.State 618.
- preparation for freezer storage and how to use them, 415.
- production and marketing, [N.Y.]Cornell 827.
- retail demand for, 408.
- riboflavin content, 422.
- set and preharvest drop, effect of hormone sprays, [N.Y.]Cornell 761.
- small, industry in New Hampshire, charts and tables relating to, N.H. 685.
- small, of New Hampshire, markets and prices for, N.H. 263.
- small, production on toxic orchard soils, 185.
- small, varieties, Mont. 617.
- spraying and leaf injuries, W.Va. 771.
- spraying to reduce arsenical residue on, N.J. 760.
- stone, chlorosis, relation to calcium and potassium, Colo. 630.
- stone, viruslike diseases of, Utah 771.
- sulfur in, 127.
- sulfuring for drying, Calif. 440.
- testing, Okla. 787.
- tree(s)—
 - * aftereffects of New England hurricane on, 297.

ruit—Continued.

- tree(s)—continued.
 - bearing, duration of pruning effects, [N.Y.]Cornell 761.
 - diseases and pests, 200.
 - leaf roller, control, N.Y.State 642.
 - leaf roller, recent spread, and recommended controls, 359.
 - magnesium deficiency in, 777.
 - nutritional requirements, N.Y.State 618.
 - phosphate nutrition, 475.
 - root injury and recovery, 66.
 - unproductive, effect of heavy applications of manure, [N.Y.]Cornell 761.
 - viroses and California regulatory laws, 58.
 - viruses, graft transmission, persistence and migration of, 59.
 - young, widening crotch angles, effect of indoleacetic and indolebutyric acids in, Idaho 320.
 - tropical, studies, 764.
 - use in food products, 584.
 - variety tests, N.Y.State 618, Tex. 757, Utah 758.
 - vitamin C in, 852.
 - waxing, tests, 191.
- Fruitify(ies)—
- control, U.S.D.A. 784.
 - development, effect of low temperatures, 651.
 - Formosan, effect of winter temperature of Japan, 651.
 - pupal parasite, shipment to Dominican Republic, P.R. 640.
- Fuels, motor, U.S.D.A. 725.
- Fumigation—
- double, time interval in, 790.
 - principles for insects in stored products, 79.
 - research, U.S.D.A. 784.
- Fungus(i)—
- associated with cotton diseases, 774.
 - associated with *Dendroctonus frontalis* in killing shortleaf pines and effect on conduction, 354.
 - associated with grass seed, 470, 480.
 - brown rot in Britain, host plants, 201.
 - chemistry of, 596.
 - collections, important additions to, U.S.D.A. 768.
 - destructive, on plantain and violet in District of Columbia area, unusual collections, U.S.D.A. 199.
 - different toxicity ratings of compounds by, 628.
 - diseases of truck crops, U.S.D.A. 769.
 - filamentous, auxithals synthesized by, 304.
 - for thiamin assay, 22.
 - growth rate in presence of cocarboxylase, and moieties of thiamin, 742.
 - growth substances for, survey of literature, 20.
 - latent infections caused by, 481.

Fungus (1)—Continued.

- nutrition, 596.
- of Mount Shasta, host index, U.S.D.A. 60.
- of Mount Shasta, host index, additions, U.S.D.A. 769.
- of Venezuela, additions to, 593.
- parasitic, germination of spores, effect of relative humidity, 16.
- parasitism of economic insects by, 628, 790.
- recovered from dust of rice strawstacks, Tex. 770.
- sclerotial, on rice, physiological studies, 346.
- seed-borne, of crop plants, control, N.Y. State 630.
- species of phytopathological interest, 481.
- spores, micrographic studies, 160.
- spores surviving irradiation, effect of monochromatic ultraviolet radiation on growth, 16.
- survival in digestive tract of cattle, 772.
- wood-rotting, on apple trees, 351.

Fungicides—see also Sprays and specific kinds.

- copper, see Copper.
- effect on fungi in culture, rapid method of testing, 482.
- predicting protective value, in laboratory, 628.
- spore-germination tests, 202, 628, 629.
- studies, 845.
- tenacity, laboratory biological assay of, 844.
- testing in laboratory before field use, value, 481.

Fur-bearing animals—

- composition of vesical calculi, 820.
- parasites, in Illinois, 641.
- vitamin requirements, U.S.D.A. 794.

Fur—

- fiber(s)—
 - classification and description, 570.
 - research, problems in, 139.
 - type of, 139.
- graying and other disturbances due to vitamin deficiency, 419.
- laws, 1939-40, abstract of, 213.

Furniture carpet beetle, new parasite of, 372.

Furunculosis in Oregon fish, 245.

Fusarium—*bulbigenum*—

- blasticola* in Argentina, 488.
- lycopersici*, single-spore isolates from, pathogenic and cultural variation, 777.
- on narcissus bulbs, control, 636.
- cross-inoculations from tobacco and sweetpotato, 629.
- foot rots of peas, N.Y. State 630.
- genus in Argentina, 481.
- juice obtained with a wet crushing mill, alcoholic fermentation by, 23.
- Uni*, variations in, 627.

Fusarium—Continued.

- moniliforme* damaged corn, effect on nutritive value, 507.
- moniliforme* on cotton seedlings and bolls, 774.
- niveum*, synthesis of biotin and thiamin by, 304.
- orthoceras*, notes, 211.
- ovysporum cubense*, growth in soil, 631.
- ovysporum* f. 3, cause of abacá wilt, 204.
- scirpi acuminatum* on carnation in Argentina, 61.
- vasinfectum* on pimiento peppers, 64.
- wilt of tomato, resistance of Riverside variety to, 65.
- wilt organisms, 627.
- yellow of sugar beet, Mont. 630.

Fusicladium dendriticum, see Apple scab.*Fusicoccum amygdali*, cause of peach canker, 628.

Galactose, failure to produce cataract in rats, 698.

Galerucella wanthomelaena, see Elm leaf beetle.*Galerucida bicolor* on yams, bionomics, 504

Gall midges—

- attacking seed heads of cocksfoot, 221.
- oviposition in, affecting seed production in grasses, 792.
- separation of species, 225.

Galls, insect, and their producers, 497.

Game—

- animals, insects of forest floor available as food for, 70.
- big, inventory of United States, 212.
- preserve, national, Sullys Hill, North Dakota, 218.
- survey in northeastern Tennessee, 213.

Garbage disposal, municipal methods as related to spread of trichinosis, 393.

Garden beetle, Asiatic, parasites of, U.S.D.A. 503.

Gardenia(s)—

- bacterial disease, [N.Y.] Cornell 769.
- bacterial leaf spot, 779.
- bud formation, abscission, and flower production, effect of light and temperature, 195.
- cultural requirements, [N.Y.] Cornell 765.
- culture, U.S.D.A. 476.
- flowering, effect of root temperatures, N.J. 765.
- grown in nutrient solutions, mineral deficiency symptoms of, 211.
- new leaf spot and canker, 627.
- requirements for soilless culture, Ohio 765.

Gardening, solution, treatise. 25.

Garlic—

- cloves, selection and disinfection for planting, Tex. 770.
- drying, Tex. 823.

Garment plants in three types of communities of Mississippi, women employed in, 692.

Gars, summer food habits, Tex. 782.

Gasoline, chemistry of, Iowa 678.

Gastric juice, calcium in, 275.

Gastritis, parasitic, effect of phenothiazine, 396, 817.

Gastrophilus—

inermis, unpublished records of specimens, 221.

intestinalis, see Botfly, horse.

nasalis, see Botfly, throat.

spp., test of phenothiazine against, 531.

Gelatin, effect on power of women to perform maximal anaerobic work, 843.

Gene(s)—

and chromosome theory and cytology, 456.

and chromosomes, Cold Spring Harbor Symposium on, 862.

interaction, dominance an incidental manifestation of, 604.

Genera as natural units, 592.

Genetics and Lysenko, 604.

Genetics, modes of research in, 288.

Geography contributions to land classification, Mo. 829.

Georgia Station, notes, 142, 431.

Georgia Station, report, 141.

Georgia University, notes, 142.

Geraniol—

and eugenol mixtures, attractiveness to Japanese beetle, 357.

distillation, standard method for, U.S.D.A. 493.

Geranium aphid, new, 363.

Geranium leaf curl and mosaic, Wash. 353.

Giardia odatrae, from intestine of muskrat, strains in, 103.

Giardomyia rhododendri, notes, 216.

Gibberella—

fujikuroi, biological antagonism to *Trichoderma viride*, 346.

saubinetii, development in corn pith following stalk inoculations, 629.

saubinetii survival in digestive tract of cattle, 772.

seas damaged corn, effect on nutritive value, 507.

Gins, operating costs and financial conditions, Tex. 828.

Girls—

adolescent, diet of, 555.

individual growth records from birth to maturity, 696.

Gizzard worm, arthropod intermediate hosts of, 533.

Gladiolus—

bulbs, dormant, oxygen intake and carbon dioxide output, 16.

corms, formation of β -o-chlorophenyl-gentiobioside from absorbed o-chlorophenol, 20.

corms, induced formation of β -gentiobiosides in, 20.

corms, sensitivity during artificially prolonged rest period, 593.

flowering, and intermittent light, 337.

thrips, studies, Ind. 212, U.S.D.A. 784.

thrips, summer sprays for control, Mich.

Glass—

fibers, chemical identification, 717.

wool, as substratum in seed testing, Conn.[New Haven] 461.

Gleditsia—

spp., diseases due to *Thyronectria austro-americana*, 68.

triacanthos, bacteria associated with, 168.

Gliricidia sepium, use as vanilla-supporting trees, P.R. 618.

Glomerella—

cingulata—

Oelastrus scandens new host for, U.S.D.A. 190.

control on mango, 497.

on black pepper, control, 485.

gossypii control by seed treatment with sodium hypochlorite, 484.

gossypii on cotton bolls and seedlings, 774.

Glutamine and asparagine in beets and spinach, relative rates of production, R.I. 13.

Glutathione—

effect on selenium toxicity, 524.

protective effect, on copper-induced oxidation of ascorbic acid in milk, 386.

role in breaking of rest period of buds by ethylene chlorohydrin, 19.

Glycine, essential factor for growth of bacteriophage, 21.

Glycogen break-down and synthesis in animal tissues, 697.

Glycoside formation in plants from absorbed substances, 16.

Glyphonyx recticollis in Florida Everglades, 223.

Gnat, clear lake, U.S.D.A. 784

Gnathocerus cornutus, notes, Mont. 785.

Gnomonia ulmas, notes, 637.

Gnomonia veneta, notes, 637.

Gnorimoschima lycopersicella, see Tomato pinworm.

Goat(s)—

and sheep breeds, crossing for fleece and meat production, U.S.D.A. 747.

Angora, grazing studies, Okla. 795.

Angora, notes, Tex. 796.

breeding, applications of reproduction physiology to, 814.

breeding, milk flavor important in, N.Y. State 235.

English, nonpathogenic amoeba in, 819.

fasting metabolism of, 373.

gastrointestinal worm parasitism acquired during winter season, 247.

milk and blood, ascorbic acid in, 236.

parasites, external, Tex. 787, U.S.D.A. 784.

toxicity of *Sartwellia flaveriae* to, 819.

vitamin B group requirements, [N.Y.] Cornell 795.

Goatsuckers, North American, life history, 73.

Goiter, congenital, in chicks, 510.

Goiter in farm animals, prevention, Mont.

- Golden oak scale, anatomy, biology, and effect on host trees, 647.
- Goldfish—
 death, caused by *Lernaea carassii*, P.R. 640.
 toxicity of new insecticidal compounds to, U.S.D.A. 784.
- Golf greens, increase of potash losses from, by heavy ammonium sulfate applications, Ind. 179.
- Gonadotropic—
 extracts, effect of chlorophyll on activity, 459.
 extracts, effectiveness, modification of, 176.
 extracts, reaction of immature female guinea pigs to, 460.
 hormone(s)—
 destruction while exerting action on ovaries, 460.
 failure to increase fertility of sterile cows, [N.Y.]Cornell 747.
 of discharged rabbit pituitary, restitution, relation to diet, 29.
 production of rats, effect of age and nature of injected hormone preparation, 175.
 pituitary antagonist, effect of heat on, 30.
- Gonadotropin—
 from pregnancy urine, mechanism of action, 176.
 from pregnant mare serum, electrophoretic homogeneity of, 316.
 from pregnant mare serum, highly purified, biological properties, 459.
 standards, international, comparison, 29.
- Gonads of hypophysectomized pigeons, effects of oestrone, testosterone, and pituitary extracts, 176.
- Gonicocotes hologaster*, see Fluff louse.
- Gooseberry (ies)—
 diseases, N.Y.State 630.
 Indian, ascorbic acid in, 424.
 leaf spots, control, 66.
 magnesium deficiency in, 777.
 powdery mildew control, 66.
 southern, susceptibility to *Oronartium ribicola*, U.S.D.A. 769.
- Gopher, pocket—
 damage to seed and seedlings on Douglas fir cut-over lands, U.S.D.A. 641.
 distribution and variation in southwestern United States, Tex. 355.
 of Texas, Tex. 782.
- Gossypium* genus, taxonomic relations, 446.
- Gourds, useful and ornamental, U.S.D.A. 331.
- Government service as a career, 255.
- Grafting-wax melter, construction and operation, U.S.D.A. 758.
- Grain beetle—
 flat, Mont. 785.
 foreign, Mont. 785.
 saw-toothed, as pest of dried fruits, U.S.D.A. 783.
 saw-toothed, notes, Mont. 785.
- Grain(s)—see also Cereal(s) and Oat(s), Rye, Wheat, etc.
 area, cash, advisability of expanding, S.Dak. 828.
 crops, green bug damage to, 80.
 digestibility, effect of fineness of grinding, S.Dak. 806.
 diseases, seed-borne, problems of, N.Y. State 202.
 fall-sown, seedbed preparation for, Okla. 752.
 fields, annual weeds in, control, N.Dak. 471.
 foot and root rots in the Dakotas, U.S.D.A. 59.
 germination, effect of fumigants on, 358.
 insect infestations, survey, 361.
 land, crown gall organism persistent in, U.S.D.A. 769.
 marketing, cooperation in, Iowa 408.
 marketing, cooperative, by local warehouses and elevators in Northwest, U.S.D.A. 541.
 mosaic disease virus, new, and its carrier, interrelations, 203, 646.
Pythium foot rot of, in Virginia, U.S.D.A. 769.
 rusts in Oklahoma, U.S.D.A. 342.
 rusts, unusual development in Oklahoma, U.S.D.A. 199.
 seed treater, Oklahoma hot-water, custom operation, 627.
 seed, treatment with mercury dust as protection against weevil damage, Ind. 179.
 selenized, effect on growth rate of chicks, 511.
 stored, insects of, U.S.D.A. 784.
 stored, pest control, U.S.D.A. 784.
 stores, new records of insects in, 361.
 white, use in poultry rations, Idaho 732.
- Granary, ever-normal, as insect problem, 358.
- Granary weevil, studies, 788, Mont. 785.
- Grape(s)—
 American, forty varieties tested for resistance to chlorosis, Colo. 764.
 American, survey of eight mineral elements and nitrogen in young leaves, 475.
 berry moth—
 control, Pa. 648.
 cultivation and insecticides for, U.S.D.A. 783.
 spray schedule for, Pa. 495.
 black rot on muscadines, Ga. 59.
 Concord, uneven ripening of, Okla. 787.
 criterion of maturity, search for, N.Y. State 622.
 culture, pruning and breeding at Fredonia Vineyard Laboratory, N.Y. State 618.
 Delaware, eight elements in young leaves, spectrographic determination, 763.
 diseases, European, 480.
 effect of rootstocks, Ark. 617.

Grape(s)—Continued.

- grown in Minnesota, biochemical studies, Minn. 437.
- improvement and outstanding seedlings, 760.
- juice-blending, Tex. 725.
- juice, Concord, chemical study, 732.
- leafhopper control, 359.
- mature vineyard, causes of spoilage, U.S.D.A. 783.
- moth, action of sex scent in, 788.
- muscadine, cold injury to, Ga. 44.
- muscadine, rooting, use of hormones in, Ga. 44.
- production, prices, returns, etc., N.H. 685.
- propagation and utilization, Tex. 757.
- rootstocks, testing, Ariz. 44.
- seedless Emperor, 335.
- Today, heat required to bring to maturity, 193.
- uneven ripening, cause, Ark. 617.
- varieties, American, adaptability to southern conditions, 764.
- varieties, 5-year test, many casualties in, Miss. 334.
- vinifera, pruning, U.S.D.A. 756.
- vinifera, somatic mutation in, 335.

Grapefruit—

- Arizona, changes in invert sugar and sucrose during ripening, 193.
- fertilization in Arizona, 55.
- indexes of maturity in, Ariz. 44.
- Marsh, in Arizona, tree composition, yield, and quality, 623.
- mottle leaf, zinc sulfate sprays for, P.R. 630.
- nitrogen nutrition, relation to yield and quality, 623.
- quality and yield, factors affecting, Ariz. 44.
- ripening, effect of growth-promoting substance containing fluorescein dye, Tex. 757.
- storage requirements, Ariz. 44.
- storage rot, apparently undescribed, 58.
- vitamin C potency, effect of maturation and cold storage, 564.

Grapevines—

- Pierce's disease of, 480.
- transpiration rate, effect of electrolyte content of soil water, 741.
- Graphidum strigosum*, parasite of rabbit, 72.
- Graphiola* leaf spot of date palms, Ariz. 59.
- Graphium rigidum*, effect on specific gravity and strength of pine wood, 480.
- Grapholita molesta*, see Fruit moth, oriental.
- Grass(es)—see also Grassland, Lawn(s), Meadow(s), Pasture(s), etc.
- artificially dried, carotene in, 508.
- at different stages of maturity, riboflavin in, 227.
- breeding, Mont. 612, Utah 753.
- carotene content, 89.
- composition at various stages of maturity, and changes occurring during haymaking, 89.
- composition, effect of weather, Okla. 752.

Grass(es)—Continued.

- conservation of nutrients by ensiling, artificial drying, and natural curing, Vt. 235.
- dehydrated, in rations, effect, 510.
- disease in Pacific Northwest, host index, U.S.D.A. 630.
- diseases caused by *Helminthosporium* spp. not previously recorded in Britain, 632.
- diseases, notes, R.I. 60.
- effect of spring and fall grazing on forage production and seeding habits, Utah 754.
- fine turf, compost materials for maintenance, Pa. 464.
- fine turf, variety tests, Pa. 464.
- foot and root rots in the Dakotas, U.S.D.A. 50.
- forage, breeding for adaptation to southern conditions, 178.
- forage, culture experiments, Mont. 612.
- forage, disease control, 627.
- forage, variety tests, Idaho 319, Mont. 612, S.Dak. 752, Utah 753.
- green, best for calves, Miss. 89.
- head smut, host specialization in, 482.
- immature, effect of clipping and drying on yield and composition, Del. 6.
- in southern agriculture, 178.
- introduced, 1939-40 winter survival, Ga. 34.
- iodine in, Tex. 727.
- lawn and turf, fertilizer experiments, R.I. 34.
- lawn and turf, variety tests, R.I. 34.
- native, germination studies, Utah 754.
- new, grazing tests, Tex. 753.
- new, introduction for observation, Tex. 753.
- of Arizona, Ariz. 17.
- of Utah, annotated list, 446.
- pasture, root development and response to day lengths and soil moisture, R.I. 34.
- range, injury by desert termites, Tex. 737.
- range, introduced and native, germination requirements of seed, 480.
- resistance to melting out disease, Pa. 464.
- seed, fungi associated with, 470, 480.
- seed, native, testing at Kansas State seed laboratory, 470.
- seed production in, gall midges affecting, 792.
- seedlings, effect of nurse crop, S.Dak. 752.
- selenium in, S.Dak. 727.
- silage, see Silage.
- small-seeded, uniform technic for analysis, 470.
- variety tests, Okla. 752, Tex. 752.
- western, drought resistance, 16.
- Grasshopper(s)—
- baits, Okla. 786.
- confused, life history, S.Dak. 786.
- control, U.S.D.A. 784.

Grasshopper(s)—Continued.

- control, electrocutor traps for, S.Dak 786.
 - control in British Columbia, use of oil sprays in, 362.
 - control in Utah, 787.
 - control, tests of poisons in baits for, 362.
 - differential, stability of diapause state in egg of, 790.
 - dinitro-o-cresol dust for control, 645.
 - egg pods, predator of, external morphology of immature stages, 368.
 - feeding on seleniferous vegetation, selenium content, 499.
 - feeding to turkeys, 516.
 - injury to wheat, relation to stem rust, 497.
 - migratory, resistance of corn to, 645.
 - Montana, control programs, Mont. 785.
 - notes, Utah 787.
 - population, effect of idle land on, 74.
 - population of typical pastures in Blue-stem region of Kansas, 498.
 - population, relation to tillage, Mont. 642.
 - reactions to castor-bean plants, 645.
 - species and distribution, in outbreaks, U.S.D.A. 785.
- Grassland—*see also* Grass(es), Meadow(s), and Pasture(s).
- biome, 594.
 - experimentation, in Scandinavia and Finland, technic, 421.
 - products, value, in animal nutrition, 796.
 - research, N.Dak. 465.
 - research in Australia, 321.
 - vegetation, factors changing, 447.
- Grazing—*see also* Range.
- land, classification for future use and management, Mo. 829.
- Green bug—
- infestations, location by aerial survey, Okla. 786.
 - injury in Oklahoma, airplane survey, 363.
 - outbreak in Oklahoma, 80.
- Green manure(s)—
- action, N.J. 785.
 - crops, effect on nitrogen, organic carbon, and pH of Coastal Plain soils, 301.
 - crops, management on Norfolk coarse sand, effect, 590.
 - crops, variety tests, Ariz. 33.
 - for cotton and other crops, Tex. 753.
 - response of crops in rotation and in continuous culture to, Okla. 752.
 - studies, 179, Tex. 735.
- Greenhouse(s)—
- pests, insecticides for, 494.
 - problems, application of biological control methods to, 358.
 - soil, sterilizing, formaldehyde and steam mixture for, 203.

Greenhouse(s)—Continued.

- temperature relations and control in, 734.
 - thrips on citrus fruits, 645, 790.
- Grocery stores of Burlington, price variations among, Vt. 429.
- Grouse—
- damage to seed and seedlings on cut-over Douglas fir lands, U.S.D.A. 641.
 - diseases, apparently fatal, 535.
 - ruffed, endoparasitism in, 399.
 - ruffed, fall foods of, Pa. 495.
 - ruffed, new intestinal roundworm from, 399.
 - sage, parasites of, 535.
 - sharp-tailed, food habits, 492.
- Growth substances, *see* Plant growth substances.
- Grubs, white, *see* White grubs.
- Grylloblatta campodeiformis*, notes, Mont. 786.
- Guaiacol, effect in presence of barium and calcium, 166.
- Guava algal leaf and fruit spot, 636.
- Guinea pigs—
- ascorbic acid excretion, absorption, and storage in, 283.
 - genetic studies on a species cross, 172.
 - relaxation of pelvic ligaments induced by progesterone, 173.
 - spayed, with hypothalamic lesions, failure of ovarian hormones to cause mating, 173.
- Gulls, herring, protecting blueberries from damage by, 212.
- Gum weed, poisonous to livestock, Colo. 668.
- Gymnosperms, vegetative propagation with indole acetic acid, 17.
- Gymnosporangium*—
- cupressi*, notes, 211.
 - geographical distribution of genus, 201.
 - in Oklahoma, 212.
 - juniperi-virginianae*, cedars resistant to, 354.
 - rusts in Maine and host relations, 772.
- Gypsum in—
- irrigation water, Ariz. 13.
 - superphosphate, value for cotton, Ga. 34.
- Gypsy moth, U.S.D.A. 784.
- Hadrantius* species, chromosomal determinations, Tex. 757.
- Habrobracon females, stinging of eggs, 224.
- Haemaphysalis bispinosa*, *Rickettsia* sp. isolated from, 103.
- Haematobia irritans*, *see* Horn fly.
- Haemonchus contortus*, *see* Stomach worms.
- Haemoproctus* from wild birds of Mexico, 214.
- Hair fibers, classification and description, 570.
- Halticus ciliatus*, *see* Flea hopper, garden.
- Ham(s)—
- cured dry, warm storage for, Miss. 381.
 - curing, function of nitrate, nitrite, and bacteria in, 93.

Ham(s)—Continued.

frozen, curing, pumping as aid in, Pa. 507.

pickle curing, pumping as aid in, Pa. 507.

prepared from carcasses of hogs fed different feed mixtures, quality, 509.

Hambletonia pseudococcinea, parasite of pineapple mealybug, recovery and redistribution, P.R. 640.

Hamburg steak, analyses, Me. 694.

Hare(s)—

Belgian, complete unequal twin in a teratomatous tumor of, 315.

snowshoe, *Euparyphum melis* as parasite of, 214.

snowshoe, population cycle on Lake Alexander area, 491.

Harelip in mice, effect of injection of antitoxin G, 607.

Harlequin bug, control, Colo. 642, Tex. 787.

Harpalus sp., feeding habits, 503.

Hawk(s)—

asymmetry in sex glands, germ cell migration in relation to, 315

marsh, seasonal food habits in Pennsylvania, 492, 495.

Hay—

artificially dried, carotene in, 508.

artificially dried, costs, U.S.D.A. 662.

at different stages of maturity, riboflavin in, 227.

carefully stored baled, carotene loss in, Okla. 795.

color in, relation to carotene, Okla. 806.

crop, mixed seedlings of legumes and timothy v. straight clover for, Ind. 178.

crops, comparison of alfalfa, red clover, and sweetclover as, Ind. 178.

green, as source of vitamin A for calves, Pa. 517.

making, problems in, 319.

mixed, fertilizer experiments, R.I. 84.

mixed, residual effects from different levels of fertilizer, R.I. 84.

mixed, yields, effect of lime, manure, and commercial fertilizers, Ind. 179.

poor quality, nutritional deficiencies in, U.S.D.A. 662.

problems, with emphasis on quality, 226.

production and preservation, methods, [N.Y.]Cornell 752.

quick-cured, Okla. 795.

yield increase from phosphate applications, Pa. 442.

Hazelnut culture, pests of, 788.

Health—

administration and financing in rural New York, [N.Y.]Cornell 827.

public, and Bang's disease, relation, 246.

public, and foods, Mass. 124.

public, in national defense, 835.

relation to diet, 128.

Heart, abnormal bovine, 814.

Heartwater, immunity in, 523.

Heat—see also Temperature.

control, electronic relay for, 18, 002.

production, relation to protein, Pa. 507.

Heaters, orchard, operation of, Calif. 680.

Heifers—see also Cow(s).

all-roughage v. roughage and limited grain feeding, U.S.D.A. 602.

dairy, on summer pasture, value of supplementary concentrates for, Ga. 89.

dairy, protection of udders from Bang's disease, N.J. 813.

dairy, roughage as sole ration, N.J. 805.

effect of adding bonemeal and lime to rations, Tex. 806.

gains on bluegrass, alfalfa, and lespedeza pastures, W.Va. 807.

pastures for finishing, W.Va. 796.

Heliothis—

obsoleta, see Bollworm, Corn earworm, and Tomato fruitworm.

virescens, see Tobacco budworm.

Heliothrips haemorrhoidalis, see Greenhouse thrips.

Helicula undalis, see Cabbage webworm.

Helminth(s)—

of South Africa, 814.

parasites in sheep and anthelmintics used, 818.

serological reactions and species specificity, 245.

Helminthosporium—

leaf spot of corn, importance, Ind. 200.

lycopersici on tomato in Philippines, 635.

sacchari on lemon grass, 775.

sativum, variation in, induced by toxic substance from *Bacillus mesentericus*, 490.

sativum virulence on wheat seedlings, variability in association effects of other soil fungi, 482.

siccans, first record in Britain, 682.

sigmoidum irregular, notes, 846.

sp. on grasses, and tests of fungicides for, Pa. 464.

virulent from Sudan grass seed, U.S.D.A. 768.

Hemicelluloses, U.S.D.A. 725.

Hemiptera-Heteroptera, of America north of Mexico, synopsis, 79.

Hemlock, vegetative propagation, 767.

Hemoglobin in blood of cattle, effect of atmospheric temperature, 229.

Hemoglobinemia, post-parturient, in cows, Utah 814.

Hemoglobinuria, nonspecific, and acute pulmonary emphysema of cattle, essential enterotoxemias, 888.

Hemophilus influenzae, human strains, effect on influenza virus infections, 530.

Hemorrhagic septicemia, see Septicemia.

Hemp, manila, see Abacá.

Hemp, sunn, production tests, Tex. 752.

Hens—

carotene requirements, Tex. 796.

first annual rest, factors affecting duration, 510.

Hens—Continued.

- flocks of, effect of thyroxine injections on social order in, 461.
 - laying—*see also* Egg production.
 - bioelectric potential as indicator of ovulation in, 316.
 - composition and quantity of feed v. composition and quantity of body fat and eggs produced, 510.
 - effect of feeding dyes to, 95.
 - feeding, Okla. 382.
 - lability of metabolic processes in, 94.
 - manganese requirements, breed difference in, 95.
 - mortality among, 251.
 - protein requirement, Okla. 802.
 - rations, dried skim milk and soybean products in, Ind. 227.
 - rations for, Ariz. 89.
 - on vitamin B-deficient diet, intestinal yeast flora of, 228.
- Herb vegetable seeds, classification and germination, 470.
- Herbage plants, breeding, in Scandinavia and Finland, 321.
- Herbage, yield and composition, effect of fertilizers, Tex. 753.
- Herbarium labels, use of outline maps on, 18.
- Herbicides, penetration, rate and mode, 43.
- Heredity—
 - and environment in animal production, 605.
 - of baldness in chicks, Okla. 748.
 - of egg shape, Pa. 507.
 - of intelligence and temperament in dogs, U.S.D.A. 747.
 - of leaf variegation in beans, 629.
 - of pink eye in fowls, 29.
 - of resistance in mice increased by 10 generations of selective breeding, 456.
 - of resistance to *Cercospora oryzae* in rice, 605.
 - of tail abnormality in mice, 457.
 - of wheat rust resistance in H-44 and Hope wheats, 313.
 - of yellow bill color in ducks, 457.
- Heron, eastern little green, new species of cestode from, 103.
- Herpetology of Florida, 213.
- Hesperidin, effect on albino rats, 843.
- Hessian fly—
 - parasites, other hosts of, 505.
 - resistance, transference from Marquillo spring wheat to winter wheat, Kans. 502.
 - studies, Ind. 212, U.S.D.A. 784.
 - survey, U.S.D.A. 785.
- Heterakis gallinae*—
 - efficiency of phenothiazine against, 262.
 - eggs, thermal death points and heat tolerance, 789.
 - embryonation of eggs and infectivity of larvae, effect of freezing temperatures, 244.
- Heteroauxin and growth of meristems of *Brassica*, 453.
- Heterodera marioni*, *see* Root knot nematodes.

- Heteroderes laurentii*, *see* Wireworm, gulf.
- Heteroptera-Hemiptera of America north of Mexico, synopsis, 79.
- Heterosis and plant growth hormones, 17.
- Hexuronic acid, *see* Ascorbic acid.
- Hexylresorcinol, effect in presence of barium and calcium, 166.
- Hickory shuckworm on pecan, control and parasites of, U.S.D.A. 783.
- Hides and skins, U.S.D.A. 725.
- Highways, *see* Road(s).
- Hippelates*, *see* Eye gnats.
- Hippodamia washingtoni* n.sp. from Mt. Rainier, 504.
- Histidine, 1(—), injection into the dog, heat production and blood and urine constituents after, 801.
- Histological and cytological technic, handbook, 100.
- Hog cholera—
 - control, U.S.D.A. 813.
 - immunization with tissue vaccine, role of veterinarian in, 388, 530.
 - in South Africa, 814.
 - serum and virus tests, Ind. 243.
 - virus, lesions produced by, Ind. 243.
- Hogs, *see* Pig(s) and Swine.
- Holly—
 - cuttings, defoliation, by *Rhagoctonia*, 627.
 - defoliation, prevented by α -naphthaleneacetic acid, 339.
 - leaf miner, parasites, establishment in British Columbia, 642.
 - leaf miner, studies, 216.
- Home economics—
 - building national strength through, U.S.D.A. 856.
 - functioning program, treatise, 268.
- Home management, use of time in its relation to, [N.Y.]Cornell 286.
- Homocystine, ability to replace methionine in diet, effect of choline on, 274.
- Honey—
 - production, N.J. 786.
 - production in Sierra Nevada, relation to distribution of California buckeye, Calif. 653.
 - research, U.S.D.A. 725.
- Hookworm(s)—
 - immunity in calves, 394.
 - infections, dietary deficiencies and iron salts in, 716.
- Hop(s)—
 - disease control program, effectiveness and cost, N.Y.State 634.
 - downy and powdery mildews, control, N.Y.State 630.
 - downy mildew, infection capabilities, 775.
 - varieties, N.Y.State 618.
 - varieties, improvement, U.S.D.A. 756.
 - vine borer and mildews, control, N.Y.State 630.
- Horistonotus nierti*, *see* Wireworm, sand.
- Hormedin A, effect on rooting of cuttings, Iowa 471.

Hormone(s)—

- follicle-stimulating and luteinizing, quantitative determination, 459.
- follicle-stimulating, studies, 459.
- gonadotropic, *see* Gonadotropic.
- interrelation in reproduction, lactation, and mammary gland growth, 316.
- interstitial cell-stimulating pituitary, purification, 458.
- interstitial cell-stimulating properties and preparation, 458.
- lactogenic, specificity in initiation of lactation, 611.
- male, secretion by ovaries, 30.
- of anterior pituitary, proposed names for, 609.
- plant—*see also* Plant growth substances.
 - sex, trimethylamine as, 17.
 - sex, effect on blood lipids of chicks, 33.
 - sex, in *Thallophytes*, 593.
 - sex, synthesis of compounds related to, U.S.D.A. 747.
- steroid, action on ovary, 609.
- thyrotropic, microhistometric assay in day-old chicks, 32.
- transport in wheat coleoptile, polarity of, 446.
- use in rooting plants, Ga. 44.

Horn flies—

- cattle fly trap for control, U.S.D.A. 493.
- control, medication of cattle for, 222.
- notes, U.S.D.A. 784.

Horns in sheep, genetics of, 605.

Hornworm parasite and hyperparasite, 506.

Horse(s)—

- aged, endoparasites of, 531.
- artificial insemination for breeding, advantages, limitations, and uses, U.S.D.A. 316.
- blood, calcium, inorganic phosphorus, and serum proteins of, effect of disease, 388.
- breeding, management, and use, U.S.D.A. 794.
- calcium and phosphorus deficiencies in, treatment and prevention, 229.
- control of strongyles in, [N.Y.] Cornell 813.
- draft, dynamometer tests, Utah 586.
- identification by tattooing, 658.
- index of purchasing power, N.Dak. 537.
- internal parasites, effects of diet, 675.
- measuring performance in, problems involved, U.S.D.A. 381.
- moldy corn poisoning in, 819.
- outlook for, 226.
- parasites of, treatment for removal, U.S.D.A. 813.
- phenothiazine as anthelmintic for, 531.
- streptococcal infections in, sulfanilamide treatment, 675.
- vitamin A requirements and deficiency symptoms, 657.

Horsemint for honey and oil production, Tex. 787.

Horsenettle control, Ariz. 33.

Horse radish diseases, control, Ill. 205.

Horticultural research, biserial r for, 184.

Hosiery—

- cotton, finishing treatments applied to, 572, U.S.D.A. 855.
- cotton, water repellency of, 573, U.S.D.A. 855.
- women's, knit from commercial cotton yarns, U.S.D.A. 855.

House, low-cost, four-room frame, description, Ark. 677.

House planning ideas of rural women, Oreg. 130.

Houseboat and river-bottoms people, 544.

Housefly—

- as vector of bovine mastitis, 394.
- toxicity of *Lonchocarpus* root extract to, P.R. 640.

Household equipment—

- laboratory manual, 546.
- studies, Ind. 286.

Housing and household equipment, U.S.D.A. 857.

Humidity and temperature control, laboratory equipment for, 17.

Hummingbirds, North American, life history, 73.

Hurricane(s)—

- damage to trees, September 1938, 11.
- New England, aftereffects on fruit trees, 297.

of 1938, effect on apple industry of Connecticut. 297.

origin and destructive power, 297.

Hyalopterus arundinis and host, auxins of, 17.

Hybrid vigor, utilization in sweet corn breeding, 745.

Hydrocarbons and plant tissue, interaction, N.Y.State 618.

Hydrocyanic acid dosages for control of California red scale, 647.

Hydrogen-ion concentration—

- determination set, A-C powered, 603.
- effect on over-eating and diseases of digestive tract, Colo. 668.
- of soil, effect of acidifying chemicals and fertilizers on, Tex. 785.

Hydrogen sulfide, detection in bacterial cultures, cobalt v. nickel salts with other agents for, 170.

Hydrologic studies, U.S.D.A. 823.

Hydrology of Virginia, 11.

Hydrophobia, *see* Rabies.

Hygrometer, improved electrical, applications, 586.

Hylastinus obcurus, *see* Clover root borer.*Hylemnia brassicae*, *see* Cabbage maggot.*Hylemnia olivacea*, *see* Seed-corn maggot.*Hymenocallis* species, chromosomal determinations, Tex. 757.*Hymenolepis*—

- caricosa*, efficiency of phenothiazine against, 252, 317.
- caricosa* infections of chicks, effect on growth rate, 251.
- spp. in rabbits, 73.

Hymenoptera—

- of Utah, entomophagous, 787.
- parasitic, environmental resistance to establishment, 505.

Hypera—*brunneipennis*—

- habits and characteristics, 86.
- notes, U.S.D.A. 784.
- on Yuma Reclamation Project, 86.

postica, see Alfalfa weevil.

Hyperaspis bellotti predators, liberations at Rio Piedras, P.R. 640.

Hypomycetes, new, preying on free-living terricolous nematodes, 212.

Hypocrella fumiginosa n.sp., description, 23.

Hypoderma lineatum, see Cattle grub.

Hypomyces—

ipomoeae, white perithecia and taxonomy, 348.

origin and inheritance of M types in, 58.

Hypophysectomy, effect on chick embryo, 608.

Hypophysis, see Pituitary.

Hypothenemus tabacum, important enemy of *Apanteles congregatus* in tobacco fields, 506.

Hypotrichosis in rat, hereditary, 487.

Hypoxylon pruinatum, cause of poplar canker, 780.

Hypsipyla grandella, U.S.D.A. 784.

Hythergraph, application to distribution of natural vegetation types, 296.

Ice cream—

as it reaches the consumer, comparative evaluation, 100.

bacteria in, taxonomic study, 387.

body, texture, and quality, Ind. 235.

experimental properties of mix and quality of resulting product, Mo. 812.

lactose-nuclei formation in, [N.Y.] Cornell 806.

manufacture, N.Y.State 663.

manufacture of plain skim milk for, 242.

manufacture, use of frozen fruits in, Utah 806.

mixes, basic viscosity and procedure to obtain it, 243.

mixes, homogenization, homogenizers compared, 100.

mixes, pan condensed, composition and properties, relation to hydrometer readings, 243.

mixes, protein stability and effect on properties, 811.

mixes, whipping properties, U.S.D.A. 663.

pasteurization requirements for, minimum, 523.

samples, analyses, Me. 694.

sampling, accurate method for, 523.

skim milk of different treatment for, 667.

stabilizers, status, 523.

store, retail, modern trends in, Mo. 410.

technical literature, 243.

texture and structure, analysis, Mo. 387.

utilization of dairy byproducts in, U.S. D.A. 663.

Ice, melting in roof gutters and downspouts, soil heating cable for, Idaho 899.

Ichneumon nigritarius, parasite of, 788.

Ichneumonidae of New England, studies, 224.

Ichthyosis of chicks due to vitamin deficiency, Wis. 669.

Idaho Station, notes, 719.

Idaho Station, report, 430.

Idaho University, notes, 719.

Idiocerus clypealis in North Sind, change in status, 788.

Ilang-ilang, essential oil studies, P.R. 582.

Illegitimacy in rural Utah, Utah 121.

Ilinoia pisti, see Pea aphid.

Index numbers of—

prices and purchasing power of farm products, Okla. 402.

prices received by North Carolina farmers, N.C. 544.

production, price, and income, Ohio 110, 827.

Indian-meal moth, Mont. 786.

Indian men, basal metabolism of, 416.

Indiana Station, notes, 432.

Indiana Station, report, 257.

Industrial worker, adequate nutrition for, 695.

Infants—see also Children.

ascorbic acid absorption in, effect of catharsis and diarrhea, 566.

breast-fed and artificially fed, antirachitic effects of various milk treatments, 712.

epiphyseal ossification in, effect of conditions of diet and health, 844.

growth, effect of vitamin B₁, supplement, 849.

Influenza, human, virus, infections produced in ferrets by, 243.

Inheritance, see Heredity.

Inhibin, injections, effect on oestrous cycles in rats, 610.

Inositol—

crystalline, isolation from organic phosphorus compounds of soils, 158.

effect on yeast growth, 22.

Insect(s)—see also Entomology.

activity at light traps during various periods of night, 79.

affecting greenhouse plants, 642.

affecting man and animals, U.S.D.A. 784.

affecting ornamental and nursery plants, control, N.Y.State 642.

and control methods, discussion, 78.

as vectors of onion yellow dwarf, 364.

beneficial, introduction into Hawaii, 496.

biochemistry, 74.

common names approved by American Association of Economic Entomologists, supplementary list, 74.

common names in different countries, 493.

control and climate, N.J. 786.

control and weather records, W.Va. 787.

control in Union of South Africa, 790.

control measures, regional and community adaptations of, 358.

control, relation to sulfur and sulfur compounds, [N.Y.] Cornell 786.

cucurbit, insecticide tests with, Colo. 642.

destructive, losses due to, 215.

entomophagous, bionomics, 789.

entomophagous, notes, 496.

Insect(s)—Continued.

- entomophagous, searching for, 357.
- forest, *see* Forest insect(s).
- gall-causing, parasites of, 361.
- immunity and serotherapy of, 215.
- injurious to crops, *see* *special crops*.
- intestine contents, pH and buffering power, 788.
- life, effect of abnormally cold winter on, Ga. 75.
- microbial flora of, 215.
- microbiology, 74.
- mimicry and applied entomology, 788.
- mount, Riker, history of, 75.
- mounting for student collections, new method, 494.
- notes for Costa Rica, U.S.D.A. 785.
- numbers, fluctuations in, 215.
- nursery, life history and control, 789.
- of cultivated plants in Guam, survey, 358.
- of forest floor available as food for game animals, 70.
- of Nigeria, food plants of, 358.
- of Puerto Rico and Virgin Islands—noctuid moths, synonymy and habitat, 219.
- orchard, *see* Orchard insect(s) and Fruit insect(s).
- outbreaks in Europe, 788.
- parasitism by fungi, 628, 790.
- pests in stored produce, fumigation principles, 79.
- population summary of Kansas, 495.
- reared from elm bark and wood, annotated lists, additions to, 78.
- rearing, glass tubes for, 358.
- resistance and tolerance to, cooperation of agronomists and entomologists in plant breeding studies on, 358.
- role in Indian agriculture, 215.
- role in potato pit scab, 789.
- scale, *see* Scale insects.
- secretion, U.S.D.A. 784.
- State collection, value, N.Dak. 493.
- stored-grain, recognition and control, 643.
- sucking, injurious to rose, 78.
- toxicology and control, contributions of insect physiology to, Calif. 496.
- transmission of plant diseases, 496.
- transmission of plant diseases, treatise, 57.
- wood-destroying, in public buildings in Sweden, 789.

Insecticidal—

- dusts, improved method of applying, 643.
- plants, tests, P.R. 640.

Insecticide(s)—*see also* Spray(s) and *specific forms*.

- abstracts of foreign and domestic patents relating to, U.S.D.A. 494.
- apparatus for applying, new or recently developed, 358.
- contact, penetration through pronotum of American cockroach, N.H. 360.

Insecticide(s)—Continued.

- cryolite, titratable acidities and pH values, 74.
 - detergents, wetting, dispersing, and emulsifying agents, U.S.D.A. 493.
 - dispersion, new method for pyrethrum and rotenone in air, 643.
 - liquid household, effect on oothecae of German cockroach, 498.
 - materials of vegetable origin, survey, 215.
 - new coal tar, description, 75.
 - research, 345, U.S.D.A. 784.
 - tests against apple aphids, 364.
 - use on plants grown in nutrient solutions, 358.
- Insemination, artificial—
- and semen storage for cattle, U.S.D.A. 747.
 - in livestock breeding, U.S.D.A. 316.
 - of bees, U.S.D.A. 784.
 - of cows, Vt. 235.
 - of horses, U.S.D.A. 747.
 - of mares, Mont. 608.
 - technic, and measuring quality of semen, [N.Y.] Cornell 747.
 - technic and methods, 610.
 - use in progeny testing, 511.
- Insurance, agricultural, one field of International Confederation of Agriculture, 110.
- International Confederation of Agriculture, annals, 110.
- Intersexuality, experimental, effect of oestrogens on antennal sexual development of rat, 750.
- Iodine—
- in salt and feeding stuffs, stabilization, 507.
 - in water and feeding stuffs, Tex. 727.
 - lack of in ration, effect on thyroid gland in lambs, Colo. 668.
 - requirements of poultry, Colo. 655.
- Iowa College, notes, 432.
- Iowa Station, notes, 432.
- Ips scaberrimus*, outbreak in spruce stands, 788.
- Iris—
- bulbous, *Phytophthora* blight of, 636.
 - bulbous, principles of disease control applicable to, Oreg. 211.
 - ovaries, developing, cell size in, 502.
 - variety tests, Pa. 471.
- Iritis—
- as manifestation of fowl paralysis, inherent resistance of White Leghorns to, 668.
 - of fowls, transmission experiments with, 389.
- Iron—
- and copper in butter, determination, 151.
 - and copper v. liver in treatment of hemorrhagic anemia in dogs, 276.
 - for body needs, suitability of green leafy vegetables and legumes as sources, Miss. 127.
 - in blood plasma, source of, 275.

Iron—Continued.

- in bodies of rats under different conditions, total weight, Ariz. 121.
- in bread and bread ingredients, 293.
- metabolism, role of calcium in iron assimilation, 553.
- therapy and diet in hookworm control, 716.
- utilization by anemic rats, sex variation in, 276.
- utilization in dogs on milk diet, 553.

Irrigation—

- agriculture, dependence on crop rotation and livestock, U.S.D.A. 751.
- canals, lining to save water, Utah 108.
- effect on movement of lime and salts, Idaho 293.
- experiments, *see special crops*.
- methods, improved, technical assistance to farmers in, U.S.D.A. 823.
- overhead and furrow methods, comparison, Okla. 757.
- overhead, improvement of equipment, Okla. 757.
- pumping and use, Idaho 399.
- pumping plants, small, U.S.D.A. 678.
- studies, U.S.D.A. 823.
- supplemental, U.S.D.A. 824.
- surveys, Utah 823.
- water, duty of, and return flow, Mont. 678.
- wells, rapid increase in, purpose of, survey by station, Colo. 824.

Isobutyl methacrylate polymer as a mounting medium, evaluation, 13.

Isocarotene, formula for, 728.

Isotoma toddalae on *Toddalia asiatica* transferred to *Histoia toddalae*, 201.

Isodes cookei, parasite of raccoon, 783.

Jack sperm, preservation of motility, 463.

Jam(s)—

- making, use of sweetose in, 547.
- sugar tests on, 841.

Japanese beetle—

- control, U.S.D.A. 783, 784.
- geraniol and eugenol mixtures, attractiveness to, 357.
- larva, growth of head capsule, 503.
- milky disease for control, N.Y. State 642.
- milky disease, new spore-forming bacteria causing, 503.
- milky diseases, status, 503.
- parasites and related Scarabaeidae in Far East, U.S.D.A. 503.
- parasites, colonization, in Eastern States, U.S.D.A. 785.
- parasites, liberations, in 1937, U.S.D.A. 785.
- promising fungus pathogen of, 651.
- retardation work in Maryland, new developments in, 74.
- studies, Conn. [New Haven] 494.

Jaundice—

- character producing, linkage tests, 606.
- obstructive, treatment with synthetic vitamin K, 568, 569.

Jelly making, use of sweetose in, 547.

Jerusalem-artichoke as raw material for fermentation lactic acid, Utah 733.

Jewish agricultural colonization in Palestine, 691.

John's disease—

- infection of laboratory animals, 525.
- of cattle in Assam, 246.

Johnin, standardization, suitability of guinea pig as test animal, 817.

Johnson grass, variations in, 177.

Journal of Hygiene, preparation of papers for publication in, 101.

Judging of livestock, dairy, poultry, and crops, training for, Miss. 545.

June beetles in southern Wisconsin, population and host preferences, U.S.D.A. 785.

Juniper midge, pest of red cedars, 220.

Juniperus spp., effect on soil reaction, 739.

Jute and hemp fibers, chemical identification, 717.

Jute seeds, catalase activity, 446.

Kalanchoe spp. and *Bryophyllum*, synonymy, 600.

Kalanchoideae, floral anatomy, 600.

Kale, marrow stem, cut in various lengths, quality of silage from, 656.

Kale, vitamin C in, 135.

Kansas College, notes, 288, 860.

Kansas State College of Agriculture and Applied Science, history, 858.

Kansas Station, notes, 288, 860.

Kansas Station, publications available from, Kans. 430.

Kapok seed cake, feeding value, 656.

Kearfottia n.sp. on old infestations of bamboo scales, P.R. 640.

Kentucky Station, notes, 576.

Keratitis in cattle and goats, bacteriological studies, Ariz. 101.

Keratoconus experimentally produced in rats by vitamin A deficiency, 131.

Ketone-body formation, physiology, 888.

Kidney stones in animals, production on low-phosphorus diet, Wis. 693.

Kitchen waste for feeding farm livestock, 798.

Kitchingia, validity of genus, 600.

Kohlrabi stems, developmental analysis, 760.

Kohlrabi, vitamin C in, 135.

Kudzu as grazing crop for beef cattle, Ala. 88.

Kudzu, value for poultry, Ala. 89.

Kulitis, spineless, new gray mold on, 60.

Labeling slides, simple duplicator for, 602.

Labor, *see* Agricultural labor.

Lachnum, new species, 23.

Lactation—

- and pregnancy, diet during, 695.
- bibliography, 335.
- dietary requirements for, 420.
- effect of α -tocopherol additions to normal diet, 713.
- initiation, specificity of lactogenic hormone, 611.
- physiology of, numerous phases of, U.S.D.A. 682.

Lactic acid—

- fermentation, Jerusalem-artichoke raw material for, Utah 733.
- in milk, determination, 294.

Lactobacilli—

- oral, of Eskimos, effect of natural and refined sugars, 697
- taxonomy, physiology, and morphology, [N.Y.]Cornell 806

Lactobacillus—

- acidophilus* and *L. bulgaricus*, differentiation, value of certain tests in, 520.
- bulgaricus* and *L. acidophilus*, differentiation, value of certain tests in, 520.
- bulgaricus*, respiration near its maximum growth temperature, 455.
- heterofermentative species, fermentation end-products of, 520.
- heterofermentative species, pH requirements, 603.
- meleagridis*, proposed name, 822.

Lactose, crystalline modifications in, [N.Y.] Cornell 806.**Ladybeetle(s)—**

- new genera and species related to *Serangium*, 223.
- rearing, liberation, and recovery, P.R. 640.

Laelius vorax*, new parasite of furniture carpet beetle, 372.**Laemophloeus minutus*, see Grain beetle, flat.****Lake(s)—**

- biology, problems of, 595.
- metabolism of, physical and chemical factors, 595.
- metabolism, relation to Zooplankton, 595.
- productivity, role of bottom fauna in, 595.

Lamarckism, masquerade of, 604.**Lamb(s)—**

- creep-fed, growth, relation to palatability of concentrate feeds, Idaho 372.
- creep-feeding, barley v. oats for, Okla. 795.
- curing requires thorough chilling, Okla. 795.
- deleterious effect of iodine supplement in rations, Ind. 227.
- digestibility of rations, reduction by molasses, Okla. 795.
- endogenous nitrogen metabolism, 799.
- ewe, effect of feeding during first winter, Utah 374.
- ewe, feeding, Utah 657.
- export, effect of delayed slaughter on, 375.
- fattening—
 - comparative value of corn, oats, and barley in, 280.
 - comparison of rations, [N.Y.] Cornell 795, Okla. 795.
 - cut milo v. corn fodder for, Colo. 655.
 - long v. cut legume hay for, Ind. 227.
 - on cottonseed meal, hegari, and alfalfa hay, N.Mex. 92.
 - on Oregon feedstuffs, Oreg. 91.
 - rations compared, Tex. 796.
 - self-feeding v. hand-feeding, and rations for self-feeding, Mich. 92.

Lamb(s)—Continued.

- fed in northern Colorado, net returns per head, Colo. 681.
- feeding and early breeding, S.Dak. 795.
- feeding, cost data, Colo. 405.
- feeding experiments, Colo. 655, Mont. 655.
- feeding with home-grown feeds, Mont. 656.
- feedlot performance and carcass characteristics, effect of breeding, 800.
- finishing on different proportions of corn and alfalfa, Mich. 659.
- growing, soybeans and other proteins for, [N.Y.]Cornell 795.
- growth and development, factors affecting, 375.
- New Zealand Romney, Mendelian situation in birthcoat of, 28.
- nutritional condition, effect on susceptibility to artificial infestation with parasitic nematodes, 396.
- parasites, Colo. 668.
- parasites of digestive tract, treatments for control, [N.Y.]Cornell 818.
- phosphorus requirements and adequacy of home-grown feeds, Idaho 372.
- production for market, breeds compared, Mont. 655.
- production, marketing and feeding costs, Mont. 655.
- quality, factors affecting, U.S.D.A. 794.
- southern and western raised, parasitic hazards in New York, 818.
- superior type, breeding for hothouse lamb production, Pa. 506.
- tenderness, effect of degree of fatness, Tex. 886.
- treatment with phenothiazine, copper sulfate, and nicotine sulfate, comparison, 896.
- vitamin B group requirements, [N.Y.] Cornell 795.
- worms in, chenopodium for eradication, S.Dak. 813.

Land—see also Farm land(s).**city man's stake in, U.S.D.A. 686.****classification—**

- rural, contributions of soil science and agronomy, 681.
- studies, 256, Mo. 828.
- to aid appraiser, 587.
- colonization in Shelly, Italian act providing for, 257.
- colonisation in Spain, setting up bases for, abstracts of act, 256.
- credit, see Agricultural credit.
- cut-over, see Cut-over land.
- divisions, natural, of Santa Cruz County, utilization and adaptation, Calif. 298.
- dry, loss of nitrogen and organic matter from, Utah 735.
- forest, see Forest land.
- grant colleges, legislation regarding financial support, administration and work, 121.
- grant colleges, responsibilities to cooperative movement, 402.

Land—Continued.

- grant colleges, role in governmental agricultural programs, 267.
 - marginal and submarginal, types of families residing on, [N.Y.] Cornell 834.
 - overindebtedness in Switzerland, speculation in, measures against, 257.
 - ownership patterns, relation to land types in Dickinson County, Mich. 260.
 - ownership right in Yugoslavia, evolution of, 256.
 - public, acquisition in national land use program, 537.
 - recreational use, relation to land classification, Mo. 829.
 - resources in Beauregard Parish, economic use, La. 405.
 - resources, inventory and characterization, relation to cotton production, 325.
 - rough unillable, returns from in form of beef produced, Ala. 88.
 - rural, holdings in South Carolina, S.C. 537.
 - tax, graduated, principle of, Okla. 256.
 - tenancy relations, improved, legal barriers, 401.
 - tenure conditions, improving, programs for, 401.
 - tenure improvement in South, anticipated goals, 401.
 - tenure in Arkansas, Ark. 113.
 - tenure problems, needed types of research on, 401.
 - use in China, critic of methodology in previous study, 115.
 - use in Delaware, social aspects, 256, 690.
 - use in Kent County, economic study, Del. 114.
 - use in Providence County, R.I. 829.
 - use legislation in 1939, 405.
 - use on different soils, Ind. 256.
 - use planning—
 - and cultural factors in Cuba Valley, New Mexico, 688.
 - cooperative, U.S.D.A. 687.
 - efficient, 412.
 - efficient, soil surveying fundamental to, Utah 587.
 - operation in Oklahoma, Okla. 256.
 - studies, 256.
 - use problems and suggested lines of action, U.S.D.A. 687.
 - use problems of Ozarks, technics for solving, 115.
 - use, relation to soil fertility, N.J. 735.
 - waterlogged from underlying artesian basins, drainage, Utah 823.
- Landlord-tenant relations, Ind. 256.
- Lantana lace bug, synonymy and distribution, 499.
- Laphygma frugiperda*, see Armyworm, fall.
- Larch, effect of artificial defoliation, 626.
- Lard—
- hydrogenated, studies, Ind. 269.
 - nutritive properties and digestibility, U.S.D.A. 837.
 - physical and chemical characteristics, relation to value for frying, Iowa 413.

Laryngotracheitis—

- and fowl pox vaccination, 107.
 - infectious, N.J. 813.
 - infectious, of fowls in Sweden, 677.
- Lastoderma serricornis*, see Cigarette beetle.
- Laspeyresia caryana*, see Hickory shuckworm.
- Lathyrus odoratus*, origin and development of carpel in, 592.
- Lawn(s)—
- experiments, Ohio 323.
 - increase of potash losses from by heavy ammonium sulfate applications, Ind. 179.
 - lime requirements, N.J. 751.
 - sod webworm pests of, 647.
 - summer care of, 34.
- Lawngrass breeding, N.J. 751.
- Lead—
- absorption from alimentary tract, effect of diet, 277.
- arsenate—
- colloidal, studies, 216.
 - in sprays, rosin residue emulsion as sticker for, Del. 359.
 - spray residue health investigation, scope and method, 78.
 - spray residue, ratio of lead to arsenic in, 643.
 - substitute for codling moth control, search for, U.S.D.A. 783.
 - wetting agents for, tests, 216.
- biochemical behavior, 699.
- determination in biological materials, 8.
- in human blood, 700.
- in maple products, improved method for estimation, 583.
- mobilization, studies, 277.
- Leaf(ves)—
- crumpler injurious to ornamentals, Tex. 787.
 - detached, low-temperature injury in, 449.
 - excised, assimilation and respiration at high CO₂ concentrations, 309.
 - extracts, transmission spectograms of, 306.
 - relation of internal surface to intercellular space in, 169.
 - temperatures, regulating, significance of ethereal oils in, 450.
- Leafhopper(s)—
- blunt-nosed, N.J. 786.
 - infesting Persian walnut, 363.
 - on lettuce, light trap for counting or collecting, 74.
 - six-spotted, relation to lettuce yellows, N.J. 786.
 - yellow-headed, on rose, 78.
- Leather, research, U.S.D.A. 725.
- Lecanosticta aoteola*, notes, 688.
- Lecithin in milk and its products, Ind. 235.
- Legume(s)—see also Green manure and Alfalfa, Clover, etc.
- adaptation in South, 178.
 - and legume bacteria, 168.
 - antianemic potency, Miss. 427.
 - bacteria, growth, effect of biotin, Wis. 562.

Legume(s)—Continued.

- bacteria, selection of effective strains for leguminous plants, 178.
- conservation of nutrients by ensiling, artificial drying, and natural curing, Vt. 235.
- coverage studies in Alabama, 177.
- culture tests, N.Y. State 616.
- ensiling with various amounts of phosphoric acid, losses and changes from, [N.Y.] Cornell 805.
- for crop production, Miss. 320.
- forage, stands, increases in by seed treatment, U.S.D.A. 768.
- hard seeds in, Mont. 612.
- infesting weevils, host plants and parasites, 494.
- inoculants, tests, U.S.D.A. 735.
- new, introduction for observation, Tex. 753.
- nitrogen-fixation studies of *Rhizobium meliloti* strains on, 598.
- of Brazilian Amazon, keys and index, 741.
- root nodule bacteria of, 17.
- symbiosis and carbohydrate supply, 168.
- variety tests, Okla. 752, Tex. 752.
- viruses in Great Britain, identification, 631.
- winter, absorption of phosphorus and nitrogen, effect of liming, 85, 178.
- winter, culture, La. 320.
- winter, time of turning for cotton and corn, Ala. 83.
- yield, effect of fertilization, Ga. 34.

Leguminosae—

- inoculation experiments, Ariz. 13.
- of Hawaii, key, 741.
- symbiotic promiscuity in, 168.

Lemna major, reproduction, effect of auxins, 743.

Lemna minor, insects associated with, 655.

Lemon—

- Diplodia* stem-end rot, Tex. 770.
- mal secco or kurutan disease, 773.

Lemon grass—

- essential oil studies, P.R. 582.
- eye spot disease, 775.

Lentin, anthelmintic efficiency against *Oesophagostomum columbianum*, 243.

Lensites betulina, notes, 351.

Lepidoptera and parasites infesting seed pods of cowpea and wild plants, 643.

Leptodaphes ulmi, see Oystershell scale.

Lepinotus patricius, infesting seed, new to North America, 642.

Leptospira salvinii, notes, 346.

Leptospira icterohaemorrhagiae, susceptible and resistant species of rodents to, 391.

Leptotaenia, taxonomy and geographical distribution of genus, 593.

Leptoteleia oecanthi, parasite of four-spotted tree cricket, 505.

Lernaea carassii, cause of death of goldfish, P.R. 640.

Lespedeza—

- cover crop, effect of low-temperature injury, Ga. 44.

Lespedeza—Continued.

- culture and utilization, U.S.D.A. 754.
- cytological investigations in, 28.
- in combination with bluegrass, U.S.D.A. 751.
- in Maryland, 319.
- Korean, management, Mo. 754.
- place in New Jersey farming, N.J. 751.
- seeding dates, varieties, and fertilizer needs, Va. 754.
- variety tests, N.J. 751.

Lespedeza scircea—

- phosphorus, availability to white rats, 657.
- selections, tests, Ga. 34.

Lestodiplosis predaceous midges, notes, 221.

Lettuce —

- breeding, [N.Y.] Cornell 750.
- breeding and improvement, Ariz. 44.
- damping-off, 60.
- fall crop, growing, Miss. 46.
- fertilization, Ariz. 44.
- fertilizer placement in raised irrigated beds for, 187.
- growth, relation to soil moisture, [N.Y.] Cornell 750.
- handling and storage, [N.Y.] Cornell 750.
- head, variety tests, Idaho 329.
- heads, temperature within, relation to that of air, [N.Y.] Cornell 750.
- improvement, Pa. 471.
- intensive production on sandy land, soil management for, Conn. [New Haven] 443.
- on alkaline-calcareous soils, fertilization, Ariz. 45.
- powdery mildew, unique case, U.S.D.A. 769.
- root aphid, Mont. 786.
- sclerotiniase, notes, Ariz. 59.
- seed, storage requirements, Ariz. 44.
- seedlings, growth, effect of growth regulating substances, 16.
- shot-hole or antirrhizome fungus, host range and overwintering, 628.
- vitamin C in, 135.
- yellow, relation to six-spotted leafhopper, N.J. 776.

Leucocera laevicollis, destruction of native red cherry by, P.R. 640.

Leucocytosoon—

- from wild birds of Mexico, 214.
- smithii* in turkeys, 535.

Leucosis—

- fowl, filtrable agent of, 677.
- fowl, notes, U.S.D.A. 813.
- fowl, transmission, 389, Ind. 243, Mass. 107.

virus, propagation on chick embryos by intravenous inoculation, 251.

Licnic acid of oiticica fat, nutritive value and efficiency, 840.

Life resources surveys, Tex. 781.

Light—see also Sunlight.

- incident, from sun and sky, calculation of, 585.

intensity in footcandles, apparatus for continuous recording, 164.

Lightning injury to potato tubers, 634.

Lignin, research, U.S.D.A. 725.

Lilium—

formosanum, culture, R.I. 44.

generative cells, effect of colchicine on division, 810.

sulphureum hybrids from controlled pollination with *L. henryi* pollen, 338.

Lily(ies)—

culture in cinder and gravel for greenhouse flowering, 194.

Easter, culture and forcing, Mass. 476.

hybrids, new race, 338.

mosaic, likely procedure for control, 487.

of the valley, *Ascochyta majalis* on, 628.

requirements for soilless culture, Ohio 765.

Lima beans, *see* Beans, Lima.

Limberleg' of sheep, Tex. 813.

Lime—*see also* Calcium and Liming.

dolomitic v. high-calcium, N.J. 735.

movement, effect of irrigation, Idaho 298.

products, inspection and analyses, Mass. 740.

rate of penetration in soils under permanent grass, 740.

use in balancing our southern agriculture, 178.

Limes (fruit), Persian, seasonal variation in juice and acid content, 476.

Lime-sulfur—

effect on productivity in female San Jose scale, '647.

fungicides, commercial and home-boiled, specific gravity, Pa. 480.

Liming—

effect on boron availability in soils, Ala. 13.

in Kentucky, place and value, 177.

materials and soil, 582.

materials, determination of exchange bases and exchange capacity of soils, 582.

materials, kinds, Ga. 34.

Limnology and aquatic biology, relation to Phytoplankton, 595.

Limpet, Hawaiian, mineral constituents and vitamin content, 412.

Linkage—

auto-sex, in fowls, 607.

studies of rat, 606.

Linoleic acid requirement of white rats, Wis. 693.

Linseed oil, content and quality, U.S.D.A. 725.

Lipurus heterographus, *see* Chicken head louse.

Liponyssus bacoti, *see* Rat mite, tropical.

Lippia helleri, essential oil studies, P.R. 582.

Lissonota moonstone n.sp., description, 372.

Listerella, outbreak of abortion in sheep associated with, 672.

Listeria—

cultures, living and dead, attempts at immunisation with, 392.

Listeria—Continued.

experimental transmission among domestic animals, 391.

infection associated with spontaneous encephalitis in goats, 105.

spp., notes, 674.

strain, isolated from a premature bovine fetus, 391.

Listroderes obliquus, *see* Vegetable weevil.

Liver(s)—

and carbohydrate metabolism, 697.

dietary essentials for pigeons, and their relation to vitamin B₆, 282.

extract, riboflavin in, 293.

filtrate factor of vitamin B₂ complex, 281.

flukes of cattle in Hawaii, control, 388.

flukes of cattle, losses from, 394.

hard yellow, of sheep and cattle, Tex. 813.

human, vitamin A in, histological demonstration, 558.

of Chinese children and adults, vitamin A in, 701.

of man and animals, vitamin A and carotenoids in, 279.

of rat, vitamin A in after feeding various forms of the vitamin, 701.

riboflavin in, biological assay, 564.

v. iron and copper in treatment of hemorrhagic anemia in dogs, 276.

Livestock—*see also* Animal(s), Mammals, Cattle, Sheep, etc.

breeding, applications of reproduction physiology to, 314.

cycles in North Dakota, N.Dak. 537.

diseases, *see* Animal diseases and specific kinds.

drinking water, warming, electric heat for, Ind. 254.

effect of breeding on performance, Miss. 89.

feeder, movements of, Ind. 256.

feeding, directions, 507.

genetics of, Mont. 605.

grazing efficiency, U.S.D.A. 794.

identification by tattooing, 658.

in Ireland, economic history, 257.

judging, training for, Miss. 545.

mineral supplements for, 373.

New York, marketing, [N.Y.]Cornell 827.

poisoning—*see also* Plants, poisonous, and specific plants.

by oat hay, and other plants containing nitrate, Wyo. 101.

with selenium and oat hay, S.Dak. 813.

production in Midwest, probable effects of agricultural conservation program, U.S.D.A. 406.

relative changes in purchasing power, 1890 to 1939, S.Dak. 823.

sprays, determining toxicity, 648.

statistics, *see* Agricultural statistics.

trend of motor transportation rates for, Ohio 263.

Livestock—Continued.

- trend on State farms, Miss. 430.
- use of waste hair from, U.S.D.A. 794.
- watering facilities, improvement, U.S. D.A. 108.
- wintering problems, 226.
- Living in the open country and farming, opinions on, R.I. 119.
- Living, standards of, *see* Standards.
- Lobelia*, *Septoria* leaf blotch of, 200.
- Locoweed, toxic principles, isolation, Tex. 725.
- Locust (insect)—
 - desert, migrations, effect of duststorms, 788.
 - lubberly, control, 217.
- Locust (tree)—
 - black, growth, effect of soil type, [N.Y.] Cornell 735.
 - black, newly set, effect of phosphate on, Ga. 56.
 - leaf miner, pest of soybean, 369.
- Locusta*—
 - in Europe, distribution and migrations, 790.
 - migratoria*, phase transformation in, 788.
- Logs and stumpage prices for 1938, U.S.D.A. 341.
- Logs, grading, Ind. 196.
- Lomachaeta*, new species and key, 793.
- Lonchocarpus*—
 - roots, acetone extracts, toxicity to house-fly, P.R. 640.
 - selection, P.R. 618.
- Lonicera tartarica* cuttings, rooting, effect of indolylbutyric acid and oestrone, 339, 452.
- Lophobaris piperis*, biology, importance, and control, 653.
- Lotononis laza*, chemical studies, 523.
- Louisiana Station, notes, 860.
- Louisiana University, notes, 860.
- Lowstege sticticalis*, *see* Webworm, beet.
- Lucilia sericata*—
 - laboratory rearing for 200 generations, 83.
 - toxicity of sulfur and nitrogen compounds to, 650.
- Lumber—*see also* Timber and Wood.
 - destroyed by hurricane in Rainbow Forest, salvaging, Conn. [New Haven] 478.
 - sap stain fungi in, U.S.D.A. 768.
 - white pine, cost of production in New England, U.S.D.A. 56.
- Lunches, school, using farm surpluses, U.S. D.A. 271.
- Lungworms in sheep, treatment, 814.
- Luperodes brunneus*, *see* Corn silk beetle.
- Lupine(s)—
 - breeding and selection for disease resistance, Ga. 69.
 - diseases, 59.
- Lyctus* powder-post beetles, tests of wood preservatives against, 504.
- Lygaeus kalmii* eggs, toxicity of nitrogenous bases to, 360.

Lygus—

- insects, tests with insecticides for, Idaho 357.
- pratensis*, *see* Tarnished plant bug.
- sp. on alfalfa, U.S.D.A. 784.
- spp. on seed crops, U.S.D.A. 784.
- spp., relation to alfalfa seed production, U.S.D.A. 646.
- Lymphomatous nerve tissue, effect of intra-peritoneal injection into chickens from strains resistant and susceptible to spontaneous lymphomatosis, 532.
- Lysenko and genetics, 604.
- Lysimeter design, improvement in, 208.
- Lysimeter studies, 155, N.J. 735.
- Machinery, *see* Agricultural machinery.
- Macraoanthorhynchus hirudinaceus*—
 - anthelmintic activity of crystalline papain, 103.
 - anthelmintic activity of fresh pineapple juice against, 102, 103.
- Macrocentrus*—
 - ancyliovorus*, value of mass liberations for oriental fruit moth control, U.S. D.A. 783.
 - gifuensis*, receipt for trial against sugarcane borer, P.R. 640.
- Macrorhiza oceanica*, parasite of four-spotted tree cricket, 505.
- Macrosiphum rubellum*, variation of size within species, 217.
- Maurosporium* leaf blight of carrot, Ariz. 59.
- Macrosteles divinus*, notes, 485, 778.
- Macrosteles* n.sp., parasite of *Orchelimum*, 506.
- Maggots, surgical, ammonium bicarbonate secretion by, healing properties, 521.
- Magtiocada septendecim*, *see* Cicada, periodical.
- Magnesium—
 - and manganese, studies, 582.
 - compounds, relative availability for plants, R.I. 18.
 - deficiency in cauliflower, 186.
 - deficiency in soils induced by high rates of potash fertilization, Ind. 179.
 - deficiency of apples in Nelson district of New Zealand, 777.
 - deficiency of fruit trees, 777.
 - in body fluids, rapid determination method, 438.
 - in commercial fertilizers, 308.
 - in fertilizers, domestic source, U.S.D.A. 734.
- Mahogany seedling blight in Puerto Rico, U.S.D.A. 688.
- Maine Station, notes, 288.
- Malachius aeneus*, notes, Mont. 786.
- Malacosoma americana*, *see* Tent caterpillar, eastern.
- Malaria, avian—
 - development of acquired immunity in canary, 253.
 - oocysts of different strains, size, variability, and growth rates, 534.
- Mallards, domestic, copper poisoning tests of, 876.

- Mallow, rose, seeds, oxidizing enzymes of, effect of environment, 742.
- Mammals—*see also* Animal(s) and specific kinds.
 American, treatise, 70.
 collection of Biological Survey, 213.
 feeding on oak products, 490.
 land, of Nova Scotia, 71.
 male, effects of low environmental temperature on reproductive organs, 315.
 small, territorial behavior and populations in southern Michigan, 491.
 small, trap-removal census study, 782.
- Mammary gland—
 direct action of oestrone on, 317.
 fat metabolism, 683.
- Man, parasites of, 523.
- Man, vitamin A requirement, 279.
- Manganese—
 and magnesium, studies, 582.
 availability, effect of mineral supplements, 511.
 boron, and copper simultaneously determined in mixed fertilizers, 730.
 deficiency in crops, symptoms and diagnosis, 60.
 function, in animal nutrition, Pa. 507.
 in commercial fertilizers, 303.
 metabolism, studies with induced radioactive isotopes, 554.
 role, in nutrition of poultry and relation to perosis, [N.Y.]Cornell 802.
- Mangel(s)—
 beets v. dried beet pulp, comparison, on total-digestible-nutrient-replacement basis, [N.Y.]Cornell 806.
 fertilizer experiments, R.I. 34.
- Mangifera indica* diseases, studies, 200.
- Mango—
 anthracnose, control, 67, 487.
 dieback disease, 200.
 hopper in North Sind, change in status, 788.
- Mangosteen—
 cultivated, existence of only one variety, reason for, 337.
 plants, young, growth stimulation, 764.
 propagation, P.R. 618.
 seedlings, germination and growth, effect of yeast extract, P.R. 618.
 seeds, handling, in shipment, P.R. 618.
- Manihot, vegetative parts, anatomy, 455.
- Manitopa interrupta*, emergence from a spider egg sac, 501.
- Manure—
 liquid, use on pasture, U.S.D.A. 662.
 organic compounds in, decomposition, 590.
 spreader, power-driven, Ind. 254
 treatment against sclerosome larvae, 244.
- Maple—
 bleeding canker, control, R.I. 60.
 Kimball, technical description, 341.
 Norway, *Phytophthora* disease, N.J. 769
Phytophthora bleeding canker and basal canker diseases, U.S.D.A. 630.
- Maple—Continued.
 products, exclusion of lead from, Vt. 152.
 products, lead in, improved method for estimation, 583
 sap, sugar content, factors affecting, Pa. 478.
 sirup samples, analyses, Me. 694.
 sugar, seedlings, development and transpiration, effect of soil temperature, Vt. 197.
 sugar, *Ustulina vulgaris* decay in, 69.
- Maps made from aerial photographs, slotted-templet method for control, U.S.D.A. 825.
- Maes—
 anthelmintic treatment of, effect on development of strongylosis in foals, 397.
 breeding, applications of reproduction physiology to, 314.
 oestrous cycle and improved methods of artificial insemination, Mont. 608.
 pregnant and nursing, effect of feeding zinc to, 249.
- Margarine manufacture, development, 701.
- Marginality in rural population studies, concepts, 691.
- Marigold(s)—
 new tetraploid, N.Y. State 617.
 seeds, tests, N.Y. State 624.
- Marine bacteria, thermal sensitivity, 170.
- Market gardening, *see* Truck crop(s).
- Market reports, U.S.D.A. 118, 266, 544, 686.
- Marketing—*see also* special products.
 agreement programs as means of agricultural adjustment, U.S.D.A. 687.
 agricultural products, 256.
 agricultural products through community auctions, Md. 407.
 and purchasing associations, farmers', periodicals issued by, 265.
 cooperative—
 and purchasing associations, farmers', in North Dakota, N.Dak. 118.
 by farmers, U.S.D.A. 687.
 in the State, Okla. 827.
 of potatoes by Ohio Farm Bureau Cooperative Association, 264.
 efficient, requirements in Canada, 835.
 elements of, treatise, 263.
 government control, desirability or practicability, 835.
 of Ohio produce, program for improving, 110.
 problems in deficit production areas, 511.
- Marmm, new winter wheat, developed by Minnesota Station, 719.
- Marsh, salt, one-year record of soil and air temperature in, 592.
- Marshallagia marshalli* and *M. n.sp.* from sheep in South Africa, 814.
- Marsenina panattoniana*, host range and overwintering, 628.
- Martica testulalis* in Puerto Rico, P.R. 82.
- Massachusetts College, notes, 860.

Mastitis—

- acute, bacteriology of, 394.
 - and black disease in sheep, Mont. 663.
 - bovine, *Hippelates* flies as vectors, 394.
 - bovine, streptococci of, studies, N.II. 395.
 - cause and control by X-ray, Idaho 389.
 - caused by unusual types of streptococci, 395.
 - control in Illinois, 815.
 - detection, modified Whiteside test for, 818.
 - detection, resazurin test for, 670.
 - diagnosis, comparative accuracy of electrometric method in, 388.
 - effect of rations, Utah 807.
 - elimination, 521.
 - in dairy herd, control, Utah 814.
 - in heifers, 388.
 - infection, detection methods, U.S.D.A. 663.
 - nutritional control, Colo. 668.
 - streptococci, agglutinability, 816.
 - streptococci, chronic form, control, 247.
 - streptococci, sulfanilamide in treatment, 395.
 - studies, 813, U.S.D.A. 813.
 - subclinical, relation to soft-curd milk, Utah 814.
 - treatment with short-wave diathermy, U.S.D.A. 662.
- Maté, bibliography, U.S.D.A. 411.**
- May beetles, movements of larvae, 788.**
- Meadow(s)—see also Grass(es) and Pasture(s).**
- fescue, *see* Fescue.
 - native hay, irrigation and management, Colo. 612
- Meal moth, notes, Mont. 786.**
- Mealworm(s)—**
- dark, notes, Mont. 785
 - raising, 213.
 - yellow, morphology and histogenesis of blood of, 781.
 - yellow, notes, Mont. 785.
- Mealybug—see also specific host plants.**
- citrus, biological control, Mass. 500.
 - coconut, parasite of, establishment, P.R. 640.
- Comstock's—**
- biological control, U.S.D.A. 788.
 - biology, in Palestine, 217.
 - fungus parasite of, 791.
 - in a midwest orchard, 389.
 - on apple, control, 791.
- dwarfing of roses by, 78.
- fungus parasite of, 627.
- introduction to combat pricklypear in Palo Valley, 217.
- long-tailed, biological control, 365, Mass. 500.
- Mexican, biological control, Mass. 500.
- pineapple, in Puerto Rico, control, P.R. 81.
- pineapple, parasite *Hambrotonia pseudo-coccinea*, recovery and redistribution, P.R. 640.
- pineapple, parasite, rearing, liberation, and recovery at Lajas, P.R. 640.

Ment—see also Beef, Lamb, Pork, etc.

- cooking research, modifications of paired-eating method in, 550.
 - curing, care, and storage on the farm, 226.
 - diet, exclusive, vitamin C deficiency in, 712.
 - food products, U.S.D.A. 837.
 - meal for pigs, 231, Ind. 226.
 - nicotinic acid potency, 508.
 - preservation by cold storage, 90.
 - processed, thiamin in, 132.
 - quality and composition, factors affecting, 798.
 - quick freezing, effect on its vitamins, S.Dak. 847.
 - spoilage organisms at low temperatures, effect of CO₂ on growth, 584.
 - sulfur in, 127.
 - tenderness during cooking, factors affecting, Tex. 836.
 - vitamin B₆ in, destruction, Wis. 693.
- Medical—**
- care in rural areas, factors affecting, Ark. 688.
 - mycology, bibliography of, 523.
 - research, statistical methods for, 287.
- Medicinal plants, see Drug plants.**
- Medicine—**
- Astec, at time of Conquest, picture of, 445.
 - preventive, early history of, 243.
- Mediterranean fever, see Undulant fever.**
- Melanoplus—**
- confusus*, life history, S.Dak. 786.
 - differentialis*, *see* Grasshopper, differential.
- Melanotus communis** in Florida Everglades, 223.
- Meliseopus latiferrugineus**, *see* Filbert worm.
- Melolontha** spp., movements of larvae, 788.
- Melon(s)—**
- aphid, control, Okla. 786.
 - breeding, N.Y.State 618.
 - diseases in Indiana, 847.
 - Fusarium* ripe rot, in Connecticut, U.S. D.A. 842.
- Melonfly control, deterrents for, U.S.D.A. 493.
- Melonworm, rotenone dusts for control, 494, 648.
- Melophagus ovinus**, *see* Sheep tick.
- Melting point apparatus, micro, Ind. 150.
- Menopon gallinae**, notes, 74.
- Mesopeltis** sp., parasite of black scale, Calif. 791.
- Metabolism—**
- basal, of Indians, 416.
 - diseases of, 716.
 - human, studies, 416.
- Metagonistylum minense—**
- Amazon strain, rearing and liberation, P.R. 640.
 - dry area race, introduction into Barbados, 650.
 - new physiological races, P.R. 640.
 - parasite of sugarcane borer, 368, 494.
 - São Paulo strains, rearing in laboratory and liberations of, P.R. 640.

- Metakentrin**, proposed name for interstitial cell-stimulating hormone of anterior pituitary, 609.
- Metaphycus**—
African species, 224.
spp., parasites of black scale, Calif. 791.
- Meteorological**—
data for Minnesota, summary, 442.
observations, 442, Mass. 586, U.S.D.A. 153.
- Meteorology**—*see also* Climate, Rainfall, Temperature, Weather, *etc.*
agricultural, in Philippines, 11.
agricultural, papers, 10.
American, origin and development of, 295.
milestones in, 10.
papers on, 442, U.S.D.A. 153.
synoptic, textbook, 441.
- Methionine** in diet, ability of homocystine to replace, effect of choline, 274.
- Methyl bromide**—
as greenhouse fumigant, status, 358.
fumigation of white-fringed beetle, U.S.D.A. 498.
- 2-methyl-1,4-naphthoquinone**—
antihemorrhagic activity of, 139.
as standard of reference in comparing potency values of vitamin K, preparations, 714.
oral and parenteral toxicity, 567.
- N-methyltryptophan** administered as its acetyl derivative, availability for growth, 125.
- Mice**—*see also* Mouse.
control in Connecticut, 73.
deer, mutant characters in, inheritance and linkage relations, 28.
effect of early lethal (t^0) in, 813.
embryos of 8 days gestation, variation in, 314.
in genus *Peromyscus*, identification by red blood cell agglutination test, 782.
in orchards, control, 74, 641.
male, reproductive organs in, effect of oestrogen and androgen injections, 174.
new mutation in, affecting spinal column and urogenital system, 172.
orchard, economics and biology, [N.Y.] Cornell 781.
ovarian transplantations in, 174.
rhino condition, an allel of hairless in, 606.
tail abnormality in, inheritance, 457.
white-footed, control, toxic baits and procedure for use, 641.
white-footed, damage to seed and seedlings on cut-over Douglas fir lands, U.S.D.A. 641.
- Michels grass**, notes, Idaho 319.
- Michigan College**, notes, 861.
- Michigan Station**, notes, 861.
- Microbracon**—
leproyi under varying temperature and humidity, 788.
sannioideae, parasite of peach borer, 218.
- Micro-organisms**—*see also* Bacteria and Organisms.
and insects, biologic relations between, 74.
antagonistic interrelations, 604.
effect on soil aggregation and erosion, 156.
in ice cream, taxonomic study, 387.
in the rhizosphere, relation to resistance of plants to soil-borne pathogens, 202.
in turkeys whose blood serums agglutinate *Salmonella pullorum*, 821.
inhibiting effect of acetic acid in presence of sodium chloride and sucrose, 170.
isolated from beef at low temperatures, effect of CO₂ on growth, 564.
population in soil and in run-off from it, 589.
responsible for nitrogen fixation, effect of fertilizers, Ind. 154.
seed-borne, effect on germination, detection, classification, and control, 470.
soil, action against disease-producing bacteria, 524.
soil, and crop plants, interaction, 447.
soil, qualitative studies, 302.
wet-crushing mill for, 10.
- Microphotographic records**, inexpensive, 18.
- Microplecton fuscipennis**, establishment in United States, 654.
- Microscope**—
binocular dissecting, checking and adjusting alignment of objectives, 458.
electron, for research laboratory, 18.
- Microscopic objects**, measuring, apparatus for, 602.
- Microscopy**, fluorescence, in biology, 602.
- Microtechnic**, recent advances in, 744.
- Microterys**—
clavellatus, parasite of willow insects, 225.
spp., parasites of black scale, Calif. 791.
- Midge control** by soil fumigation, 508.
- Migrants**, treatise, 692.
- Mikania micrantha**, potential pest of major importance to Hawaii, 617.
- Mildew**—*see also* host plants.
powdery, new, description, 844.
- Milk**—
abnormal flavors, particularly cappy flavor in, Ind. 235.
activated flavor in, isolation of substances responsible for, 665.
and evaporated milk, changes in demand in New York metropolitan area, [N.Y.] Cornell 827.
and milk products, nutritional value, 518.
and milk products, oxidation in, relation to flavor, 98.
antioxidants in, enzymes and other substances as, 287.
ascorbic and dehydroascorbic acid in, effect of commercial practices, 666.
autoclaved, browning, 809.
bacteria, heat-resisting, 519, 808.

Milk—Continued.

bacteria, non-spore-forming thermophilic, 519.
 bacterial counts, made at two incubation temperatures, 664.
 bacterial population, photoelectric colorimeter in determining, Pa. 517.
 bacteriological analyses, old and new standard methods for, 97.
 canned, shipments into State, R.I. 110.
 certified, ascorbic acid content, effect of age of cow, 236.
 chemistry and bacteriology, U.S.D.A. 663.
 chocolate, suggested standards for, 523.
 composition, of Texas, variations in, Tex. 806.
 containers, paper, value of antioxidants for treating, Pa. 517.
 contamination from internal and external sources, Utah 97.
 control, new standard medium in, 809.
 cooked flavor in, factors responsible, Pa. 517.
 cooling on farm in modern electric milk coolers, 97.
 cooling, storage, and transportation, Nebr. 386.
 cost of production on Pennsylvania dairy farms, Pa. 685.
 curd tension and curd size, relation to digestion, U.S.D.A. 663.
 curd tension, effect of homogenization, U.S.D.A. 663.
 curd tension reduction and prevention of rennet clot, nature and origin of surface active materials involved in, 239.
 deaeration of, 810.
 dealers' samples in New York market, analysis, [N.Y.]Cornell 263.
 decreased yield in winter, adequate feed to avoid, Miss. 385.
 diet, adequacy for reproduction in rats, 417.
 disappearance of added glutathione in, 386.
 distribution as public utility, treatise, 115.
 dog's, composition, 664.
 dried, browning, [N.Y.]Cornell 806.
 effect of fat intake and of fat components in ration, [N.Y.]Cornell 805.
 evaporated and sterilized, canning problems, 666.
 flavor, effect of green and dried pepper grass, S.Dak. 806.
 flavor, effect of holder and flash pasteurization, 236.
 flavor, effect of metals on, 808, N.J. 805.
 flavor, effect of weeds in pasture, Mont. 662.
 flavor, relation to metals and their alloys, 98.
 flowing film, relative vitamin D potency imparted by irradiation to surface and submerged parts, Wis. 663.
 fluid and evaporated, effect on mineral and nitrogen metabolism, 844.

Milk—Continued.

goat-cow mixtures, detection, 294.
 goat's, bacterial content, 520.
 goat's, effect of pasteurization, U.S.D.A. 663.
 goat's, of known purity, composition, 664.
 grading, evaluation of methods, 664.
 growth-promoting value, for rats, variations in, 518.
 heated to high temperature, control of flavor in, Mich. 665.
 high color in, breeding for, N.J. 805.
 homogenized, frozen, watery appearance, Mich. 289.
 homogenized, used for cooking, preventing coagulation, Wis. 664.
 irradiated and vitamin D, effect on rickets in infants, 712.
 irradiated, stability of vitamin A and riboflavin in, Wis. 664.
 lactic acid in, determination, 294.
 lactic acid production in, control, Pa. 517.
 lipase, inactivation, by dissolved oxygen, 666, [N.Y.]Cornell 806.
 lipolysis in, effect of homogenization temperature, 97.
 lipolytic activity in, 239, 606, [N.Y.]Cornell 806.
 losses during evaporation process, tests for measuring, Wis. 664.
 market, carotene and vitamin A content, 848.
 market, denaturation of, 521.
 market, flavor, effect of pasteurization, Mont. 662.
 market for Ohio farmer, Ohio 410.
 marketing, N.J. 805.
 markets, up-State, organization, [N.Y.]Cornell 827.
 methylene blue and resazurin tests, comparison, 583.
 modified types, for infant feeding, method for testing suitability, Pa. 547.
 nutritional aspects, 810.
 of different breeds, relative vitamin D potency in, S.Dak. 806.
 Ohio, farm sales of through different outlets, 265.
 oxidized flavor:
 development inhibited by glutathione, 386.
 development, value of high-quality hay in preventing, W.Va. 807.
 in, relation to oxidation-reduction potentials, 98, 236.
 pasteurization—
 at different temperatures, time required for destruction of bacteria, 809.
 effect of time and temperature on properties and constituents, N.Y. State 664, 809.
 high temperature-short-time, 809.
 holder and flash method, effect on flavors, 236.
 pasteurized, gram-negative bacteria in, media for detection, 240.

Milk—Continued.

- pasteurized, thermophilic bacteria in, 664.
- pH determination in, by color indicator paper, 294.
- phosphatase, factors affecting activation, U.S.D.A. 663.
- phosphatase test, possible errors in due to bacterial growth, 808.
- plant control problems of bacterial nature, 520.
- plant equipment, action of wetting agents in wash waters, 812.
- preserving, concentration and freezing as means, 521.
- production—
 - costs, La. 116, Pa. 517.
 - decline in, relation to endocrine activity, N.J. 805.
 - effect of fineness of grinding grain on value for, S.Dak. 806.
 - input as related to output in, Ind. 234.
 - maintaining, Sudan grass pasture v. bluegrass pasture in, Ind. 234.
 - of carabaos, effect of concentrate feed, 513.
 - protein requirements for, 517.
- properties, effect of pasteurization, N.Y. State 664, 809.
- quality, control, dye reduction tests for 240.
- rancid, surface tension, relation to inhibitory effect on *Streptococcus lactis*, 665.
- raw, pasteurized, and evaporated, for dogs, comparison of nutritive values, 801.
- receipts, utilization, and prices, in Maine milk control areas, Me. 265.
- reducing system of, 336.
- resazurin test for evaluating sanitary properties, Vt. 235.
- returns secured by producer, factors affecting, Ind. 235.
- riboflavin in, comparison of fluorimetric and biological tests for, 583.
- samples, analyses, Me. 694.
- sanitary quality, checking, 238.
- sham fed to dairy calves, changes in, 385.
- skimmed, *see* Skim milk.
- soft-curd, modern aspects, Utah 122.
- soft-curd, relation to subclinical mastitis, Utah 814.
- solids, dry, density, 438.
- soluble calcium and phosphorus in, sera for determination, 730.
- specific precipitation test for, 294.
- stored in cans, various levels, bacterial content, Pa. 517.
- sunshine flavor in, protective properties of types of containers, Wis. 664.
- supply, high grade pasteurized, causes of periodic abnormalities, 685.
- supply of State, sources, R.I. 110.
- susceptible to oxidation, potentiometric method of detecting, 240.
- tests for citrin in, 853.

Milk—Continued.

- transportation, reorganization of truck routes, N.H. 409.
 - trypsin as antioxidant for, 237.
 - vitamin B₁ and riboflavin of, 519.
 - vitamin D potency—
 - effect of roughage ration, S.Dak. 806.
 - effect of sunlight and feed on, Ariz. 122.
 - relation to vitamin D in blood of dairy cows, 385.
 - vitamin in, that prevents stomach ulcers in guinea pigs, Wis. 693.
 - warming, electric soil heating cable for, Idaho 399.
 - whole v. filled, nutritive value, Wis. 664.
 - winter, feeding methods for good flavor and color, N.J. 805.
- Milking machines—
- cleaning, value of sodium metaphosphate in detergent mixtures, 97.
 - washing and sterilizing methods, Ind. 235, 240.
- Millet—
- feeding value for poultry, S.Dak. 802.
 - foxtail, cultural and varietal tests, Colo. 466.
 - foxtail, genetic studies, 27.
- Milo disease, reaction of sorghum varieties and hybrids to, U.S.D.A. 485.
- Milorganite as source of minor nutrient elements for plants, 592.
- Mimosa *Fusarium* wilt, U.S.D.A. 768.
- Mineola indigenella* injurious to ornamentals, Tex. 787.
- Mineral(s)—
- from various sources, utilization by poultry, Colo. 655.
 - in nutrition, Mass. 551.
 - metabolism of rats on extremely sodium-deficient diet, 699.
 - metabolism, studies with artificial radio-active isotopes, 137, 554.
 - nutrition of plants, importance of colloidal clay in, 539.
 - studies, 511.
- Mining, strip—
- effect on agricultural areas in Illinois and remedies, 540.
 - effect on land use, tax system and community life in area, Ohio 827.
 - protecting public's interest and formulation of public policy, 541.
- Mink(s)—
- blood glucose, plasma phosphorus and calcium, hematocrit, and bone ash values, 820.
 - digestibility of animal products and cereals, 660.
 - metabolism studies, U.S.D.A. 794.
 - nutritive requirements for growth, fur production, and reproduction in, [N.Y.] Cornell 781.
 - pentobarbital sodium as anesthetic for, 675.
- Minnesota Station, notes, 719.
- Minnesota University, notes, 719.

- Mint flea beetle, control, Ind. 212.
 Mint oil, quality, factors affecting, Ind 185.
 Mississippi College, notes, 288.
 Mississippi Station, notes, 288.
 Missouri Station, notes, 861.
 Missouri University, notes, 861.
- Mistletoe**—
 dwarf, fungus parasite, U.S.D.A 768.
 dwarf, in New England, distribution and hosts, 779.
 on persimmons, 852.
 on willow and poplars, new disease of, 365.
- Mite(s)**—
 control, U.S.D.A 784.
 dormant spray for, Pa. 495.
 infesting houses, biology and anatomy, 788.
 new, on red clover, Idaho 357.
 on water oaks and willow oaks, Ga. 75.
- Mitochondria** in plant cells, osmic impregnation method for, 18.
- Mockingbirds**, albinism in, 458.
- Mohammedan families** in Sungpan, dietary study, 271.
- Molture**—
 conservation program, costs and results in western Pennsylvania, Pa. 682.
 scale, Appalachian fuel, description, 841.
- Molasses**—
 as partial substitute for corn in chick rations, Pa. 507.
 blackstrap, antianemic potency, Miss. 427.
 butyl alcohol fermentation, use of *Olostidium madisonii*, Wis. 582.
- Mold(s)**—
 and yeast on dairy utensils, agar slice method for detection, 521.
 culture, bactericidal filtrates from, 28.
 gas requirements, 240
 in cheese, retarding, 242.
- Mollisia tetrica**, systematic study, 311.
- Monascus**—
ruber, isolated from tomato catsup, mycological study, 160.
 sp. in orange-squash, 200.
- Monilia costalis** on pecan, Ariz. 73.
- Moniesia**—
expansa, possible intermediate hosts, other than oribatid mites, 526.
 in sheep and anthelmintics against, 818.
- Monilia albicans**, notes, 673.
- Montana College, notes, 720.
- Montana Station, notes, 576, 720.
- Montana Station, report, 718..
- Montmorillonite type of clay minerals, qualitative color test for, 293.
- Morenoella quercina**, cause of oak leaf spot, 354.
- Mortgages** in 1939 compared with 1894 and 1938, S.Dak. 828.
- Mosquito(es)**—see also Yellow-fever.
 anopheline of southeastern Minnesota, survey, 220.
 anopheline, oviposition experiments, 220.
 as hosts of equine encephalomyelitis virus, 250.
- Mosquito(es)**—Continued.
 collections at Brownsville, Texas, 642.
 conservation activities in relation to, Okla. 786.
 control, and wildlife conservation, relation, 368.
 control dusts, arsenic, effect on fish, 220.
 control, treatise, 219.
 effect of attractants on, 781.
 larvicide, pyrethrum-oil emulsion v. paris green for, 220.
 of Arkansas, 85.
 of Costa Rica, 220
 studies, N.J. 786, U.S.D.A. 784.
 vectors of virus infection, methods of exposing experimental animals to, 245.
- Moth(s)**—
 noctuid, synonymy and habitat in Puerto Rico and Virgin Islands, 219.
 pests of honeybee combs, 371.
- Motortrucks**, studies, Ind. 256.
- Mouse**—see also Mice and Rodent(s).
 anomalous, with incomplete posterior duplication of body, description, 315.
 genetics nomenclature, report of committee on, 606.
 wood, territorial behavior and populations in southern Michigan, 491.
- Muck** resources of Connecticut to replace imports no longer available, Conn.[New Haven] 442.
- Muck**, well-disintegrated deep, of nonacid type, lime, phosphorus, and potassium requirements, Ind. 179.
- Mucor ramannianus**, synthesis of thiamin and biotin by, 805.
- Mucorineae**, guide to, 160.
- Mule(s)**—
 aged, endoparasites of, 531.
 breeding, management, and use, U.S.D.A. 794.
 index of purchasing power, N.Dak. 537.
 outlook for, 226.
 young, growth and development, effect of pasture fertilization, Ga. 89.
- Mung** bean seedlings, growing in solutions of 8-indoleacetic acid, responses of shoots, 161.
- Murgantia histrionica**, see Harlequin bug.
- Musa glauca**, *Sclerotium* stem rot disease, 60.
- Musca domestica**, see Housefly.
- Muscular dystrophy**—
 in rabbits, and autoxidation of animal fats, 506.
 in vitamin E-deficient rats, creatine metabolism, 284.
 nutritional, effect of nerve section upon development in rats, 373.
 prevention and cure by α -tocopherol, 713
 treatment with wheat germ, 714.
- Mushroom(s)**—
 composts, gypsum as amendment for, Pa. 471.
 houses, cecidomyiid larvae in, control, Pa. 495.
 new system of composting for, U.S.D.A. 768.

Muskmelon(s)—

- breeding and improvement, Ariz. 44.
- breeding for disease resistance, Conn. [New Haven] 471, [N.Y.] Cornell 769.
- California, improving edible quality, U.S.D.A. 44.
- downy mildew, control by dusting, Tex. 771.
- downy mildew, new copper compounds for, Conn. [New Haven] 480.
- downy mildew resistance, breeding for, Tex. 771.
- effect of different forms of copper sprays, 204.
- fruit disinfection, Ariz. 59.
- Fusarium* and bacterial wilts, Ariz. 59.
- Golden Gopher, description, 472.
- Golden Gopher, new *Fusarium* wilt resistant variety, 719.
- varieties, ascorbic acid content, 565.
- variety tests, Pa. 472.
- vitamin C in, 135.
- winter, production, P.R. 618.

Muskkrat(s)—

- parasites of, in Illinois, 641.
- population of a tidalwater marsh, effect of ditching for mosquito control, Del. 71.
- ringworm disease, transferable to man, 525.
- versatility in feeding and population maintenance, 782.
- winter feeding, in Delaware, 782.

Mycobacterium paratuberculosis in livestock, 819.*Myodiplosis alternata*, notes, 216.

Mycological research, use of photomicrography in, 744.

Mycology, medical, bibliography of, 523.

Mycorhiza growth, action of aneurin and biotin on, 743.

Myopa, new, from Utah, 787.*Myriangium* genus in North America, 311.*Myrmosula* subgenus, identification of female of, 793.

Myxobacteria of Iowa, morphology and physiology, 455.

Myxomycetes, studies, 23.

Mysus corasi, see Cherry aphid, black.*Mysus persicae*, see Peach aphid, green.*Mysus porosus*, notes, 78.

Napier grass—

- breeding, U.S.D.A. 751.
- improved strains for South, U.S.D.A. 751.

Narcissus—

- basal rot of bulbs due to *Fusarium bulbigenum*, control, 636.
- diseases, [N.Y.] Cornell 769.
- in cold storage rooms, ethylene injury to, 339.
- mosaic, additional species of aphids as vectors, 642.

Naringin, effect on albino rats, 843.

National Livestock and Meat Board, reports of activities, 90.

Naval stores research, U.S.D.A. 725.

Nebraska Station, notes, 288.

Nebraska University, notes, 288.

Nectar secretion, U.S.D.A. 784.

Necydalini, North American, revision, 503.

Nematode(s)—see also Root knot nematode. associated with Irish potatoes in South Carolina, 70.

banana, in United States, U.S.D.A. 489.

bulb, in narcissus plantings, in Oregon, U.S.D.A. 489.

bulb, of onion, [N.Y.] Cornell 769.

bursate, of horses and sheep, bionomics and control, 820.

Conference, National Plant, proceedings, U.S.D.A. 489.

early developmental stages, 783.

eggs and noninfective larvae, destruction, 244.

Fusarium-wilt experiments at Lumberton, North Carolina, U.S.D.A. 459.

in lambs, susceptibility, relation to nutritional condition, 396.

infection of sheep and goats acquired during winter season, 247.

intestinal, in sheep, phenothiazine as anthelmintic for, 396.

invasions of soil, effect, 70.

meadow, and root knot, comparison, U.S.D.A. 489.

meadow, chrysanthemum root failure due to, Tex. 771.

meadow, distribution and relation to *Fusarium* wilt of cotton, U.S.D.A. 489.

parasite, bacteria-free culture of, 103.

parasites of—

domestic animals in Burma, check list, 245.

insects, biology and economic importance, 655.

plants and free-living in Hawaii, 70.

plants catalogued under hosts, 639.

ruminants, eggs of various species, 214.

sheep, free-living stages, effect of winter on, 528.

sheep, recovery from pastures, 248.

sheep, tests of phenothiazine against, 529.

population and species determination studies in cotton wilt plots, U.S.D.A. 489.

reniform, as root parasite, U.S.D.A. 489.

sporozoan parasites of, 70.

stem and bulb, on weeds of arable land, 639.

studies at U. S. Regional Vegetable Breeding Laboratory, U.S.D.A. 490.

Nematodirus—*filicollis*, phenothiazine as anthelmintic for, 396.

in sheep and anthelmintics against, 818.

Nematology, introduction to, 213.

Neoplectana glaseri, biology and economic importance, 655.*Neophasia menapia*, see Pine butterfly.*Neostelia otharinasae* on *Otharinasae mulleri*, 200.

Nephritis in horses, 675.

Nephtytis ajacii leaf spot disease, 353.

- Nervous diseases, treatment with wheat germ, 714.
- Nervous system, pathology, in vitamin deficiencies, 704.
- New Hampshire Station, notes, 142, 861.
- New Hampshire University, notes, 142, 861.
- New Jersey Stations, notes, 432.
- New Jersey Stations, report, 859.
- [New York] Cornell Station, notes, 142.
- [New York] Cornell Station, report, 859.
- New York State Station, notes, 142, 720.
- New York State Station, report, 718.
- Newspapers, Washington weekly, content, Wash. 411.
- Newts, feeding habits of larvae, 492.
- Nicotiana*—
- glutinosa*, shoot enations on midrib and petiole, 627.
- resistance to root knot nematode in U.S.D.A. 489.
- Nicotine(s)—
- and nornicotines, optically active, toxicities to *Aphis rumicis*, 360.
- bentonite sprays, avoiding obvious residue from, 77.
- concentration-mortality curves for solutions toxic to eggs of *Lygaeus kalmii*, 360.
- peat, supplementary spray materials for use with, 360.
- spray combinations for roses, persistence of nicotine on, 361.
- tests against apple aphids, 364.
- Nicotinic acid—
- as antipellagra factor, steps leading to recognition of, 851.
- assaying food for, method, Wis. 693.
- deficiency encephalopathy, case reports, 708.
- in cereals and pellagra, 708.
- in urine, determination, 9, 274.
- intake, relation to coenzyme I level of blood, 707.
- metabolism in sheep, 799.
- properties, food sources, and stability, 847.
- synthesis, by rats, 707.
- urinary excretion of, 707.
- Night blindness and vitamin A, 419.
- Nippostrongylus muris*, resistance of rats to, 526.
- Nitella*—
- action curves with single peaks in, relation to movement of potassium, 166.
- potassium isotopes in, separation, 166.
- Nitrification in soils under different conditions, Tex. 735.
- Nitrogen—
- absorption by winter legumes, effect of liming, 178.
- accretion, under several cropping systems, [N.Y.]Cornell 751.
- conversion to protein in vitro, 663, Wis. 662.
- economy of soil, relation to algae, 739.
- fertilizers, effect in correcting overliming injury, N.J. 758.
- Nitrogen—Continued.
- fixation—
- by legumes, soil factors in, 168.
- by micro-organisms, Pa. 442.
- micro-organisms responsible for, effect of fertilizers, Ind. 154.
- studies, N.J. 735.
- studies of *Rhizobium meliloti* strains on legumes, 598.
- symbiotic, by legumes, mechanism, 168.
- symbiotic, effect of mineral fertilizers, 455.
- symbiotic, respiratory enzyme systems in, 17.
- in milk, semimicro-Kjeldahl method for determination, 582.
- in plants, atmospheric ammonia as primary source, 207.
- in soil, correlation with yields, Pa. 442.
- in soil, effect of cropping practices, S.Dak. 735.
- in soil, effect of green manure crop management, 177, 590.
- metabolic balance, in Eskimo children, 554.
- metabolism of plant embryo, 450.
- studies, 582.
- Nitzschia closterium*, photosynthesis of light energy absorbed by carotenoids in, 16.
- Nodular worms, immunity in calves, 394.
- Nodule bacteria—
- biotin as growth stimulant, 742.
- lyso-resistance of, and practical importance, 168.
- of legumes, 17.
- percentage utilization of substrates by, 455.
- Nodule formation, physiology, 168.
- Nomenclature, zoological, treatise, 630.
- North America, people and resources, development, and prospects as home of man, 402.
- North Carolina College, notes, 576.
- North Carolina Station, notes, 576.
- North Dakota College, notes, 720.
- North Dakota Station, notes, 720.
- Northern Great Plains Committee, appointed by Federal Government, work of, 261.
- Nothopus grossus*, feeding habits, 508.
- Nucleoli and satellited chromosomes, 745.
- Nun moth, parasitization, by insects, 788.
- Nursery stock—
- freezing injury, U.S.D.A. 768.
- inspection, certification, and transportation, Ky. 332.
- Nut(s)—
- diseases in Pacific Northwest in 1940. U.S.D.A. 342.
- sulfur in, 127.
- Nutgrass—
- control, Ariz. 33.
- introduced into Utah, Utah 43.
- life history as related to control, Ala. 33.
- Nutmegs, culture, P.R. 618.
- Nutrient media, see Culture media.

Nutrition—*see also* Diet.

- adequate, for industrial worker, 695.
- animal, *see* Animal nutrition.
- diseases of, 716.
- essentials of, textbook, 841.
- human, availability of ascorbic acid in foods, method for study, 426.
- in India, bibliography, 548.
- level, assessment of, 274.
- minerals in, Mass. 551.
- plant, *see* Plant nutrition.
- recent findings in, 841.

Nutritional—

- deficiency, diagnosis and treatment, 843.
- status, medical evaluation in survey of high school students, 842.

Nutshells, composition, 727.

Nygmia phaeorrhoea, *see* Brown-tail moth.

Nylon fibers, chemical identification, 717.

Nystus ericae, *see* Chinch bug, false.

Oat(s)—

- anthracnose, 687.
- breeding and propagation, Tex. 757.
- butt rot, 779.
- heart rot, cause, 488.
- leaf spot, due to *Morenoella gueriniana*, 354.
- pin, chlorosis of, control, 780, N.J. 769.
- pin, chlorotic, treatment by trunk injections, 628.
- prediction of decay following fires in, U.S.D.A. 768.
- use by birds and mammals, 490.
- white, stumps, sprouting from, 840.

Oat(s)—

- amino acids in, U.S.D.A. 725.
- and corn, relative labor requirements for, Ga. 110.

Anguillulina dipsaci on, relation to weed hosts, 639.

- breeding, Ga. 83, Ind. 178, Mont. 612, N.J. 751, [N.Y.] Cornell 751, Pa. 464, S.Dak. 752, Tex. 752.

coleoptile(s)—

- curvatures, shadowgraph recording of, 18.
- growth after soaking grains in various solutions, 896.
- maintaining high potential growth rate by pretreatment with auxin, 17.
- peptidase activity in, 453.
- protoplasmic streaming in, 16.
- respiration, protoplasmic streaming, and auxin transport in, relation 16.
- combining v. binding, Pa. 464.
- crown rust epidemics, origin, Ark. 680.
- crown rust, relation to yield, test weight, and lodging, 846.
- culture experiments, Mont. 612, Okla. 752.
- de-hulled, seed value, 470.
- effect of clipping, Ind. 179.
- effect of preceding crop, 320.
- expanded production and value of winter legumes, Miss. 819.
- feeding value for poultry, S.Dak. 802.

Oat(s)—Continued.

- fertilizer experiments, Miss. 755, Tex. 753.
- flour as antioxidant in dairy products, N.J. 805.
- foot disease, new cause of, 773.
- for increasing feed for livestock, Miss. 34.
- hay, nitrate content, Colo. 668.
- hay poisoning of livestock, S.Dak. 813.
- in lamb-fattening ration, Okla. 795.
- kernels, fatuoid and normal, dormancy in, 27.
- planting tests, W.Va. 754.
- Portuguese, of section Euavena, 755.
- production in Mississippi, Miss. 319.
- promising strains, Ark. 612.
- reaction to strains of *Ophiobolus graminis*, 632.
- rhizosphere of, microbial population in, 447.
- rust resistance, breeding for, Tex. 770.
- seed, variations in trueness to variety and in productiveness, N.Y.State 616.
- seeding and rotation experiments, Miss. 755.
- smuts, physiologic races, problems in determination, 345.
- stem rust and crown rust, seedling reactions of varieties to, 345.
- stem rust on fall-sown crop, U.S.D.A. 199.
- Sussex ground, and white corn meal, comparative net energy for fattening cockerels, 232.
- variety tests, Ga. 33, Miss. 755, Mont. 612, N.Dak. 180, N.J. 751, Okla. 752, Pa. 464, Tex. 752, W.Va. 754.
- variety yields, Miss. 319.
- whole, value for turkeys, Pa. 507.
- wild, seed, variations in dormancy, 329.
- winter, superiority over spring, Ark. 612.
- yield increase from phosphate applications, Pa. 442.
- yield's, per pound pure nitrogen applied, Miss. 34.

Oatgrass, tall—

- adaptation, Ga. 34.
- hay and seed yield, effect of ammonium sulfate on, Idaho 319.

Obesity in childhood, 272.

Oecanthus nigricornis quadripunctatus, *see* Cricket, four-spotted tree.*Oeciacus vicarius*, infestation of a high school by, 642.*Oesophagostomum*—*columbianum*—

- anthelmintic efficiency of compounds related to phenothiazine, 248, 896, 672.
- anthelmintic efficiency of Lentin against, 248.
- in sheep, control, 818, Ga. 105.
- venulosum*, tests of various drugs on, 248.

Oestradiol—

- benzoate treatment of eggs, sexual development of chicks from, 82.

Oestradiol—Continued.

effect on social organization of flocks of hens, 176.

Oestrin, effect on blood lipids of immature fowls, 32.

Oestrogen(s)—

administration, effect on blood calcium, and fat and bone formation in cocks and drakes, 510.

effect on antenatal sexual development of rat, 750.

production in follicular fluid and urine of mare, relation to oestrous cycle, 610.

site of action, 750.

Oestrogenic compounds, relative potency on baby chicks, 463.

Oestrone—

injections, effect on feathers of Brown Leghorns, 607.

mammary stimulating, action of, 317.

Oestrous cycle—

in ferret, experimental modification by different intensities of light irradiation and other methods, 315.

in rats, effect of non-androgenic testis extract, 610.

Oestrus in spayed rats, induction by auxiphyle, 749.

Oestrus ovie, see Botfly, sheep.

Office of Foreign Agricultural Relations, report of Director, U.S.D.A. 686.

Ohio Station, notes, 288, 576.

Odium albicans, notes, 673.

Oil(s)—see also Fats and specific oils.

chemical products from, U.S.D.A. 725.

compositions, U.S.D.A. 725.

deposit from sprays, N.Y.State 642.

distillates, undiluted low-boiling petroleum, phytotoxic properties, 76.

spray residue on citrus leaves, determination, 644.

sprays, new facts about, 790.

sprays, studies, Conn.[New Haven] 495.

vegetable, and butterfat, comparative nutritive value, 413.

wholesale prices, in United States, index numbers, U.S.D.A. 543.

Oitica—

fat, licanic acid of, nutritive value and efficiency, 840.

oil, production, in Brazil, U.S.D.A. 410.

Oklahoma Station, report, 859.

Olive oil, digestibility, effect of adding stearic acid to, U.S.D.A. 837.

Olive tree, aerial root primordia, relation to vegetative propagation, 601.

Onion(s)—

bacterial disease, [N.Y.]Cornell 769.

bloat, status, U.S.D.A. 59.

breaking dormancy in, methods, Tex. 758.

breeding, Colo. 617.

breeding for resistance to purple blotch and thrips, Colo. 630.

bulb nematode, [N.Y.]Cornell 769.

fall v. spring planting, Idaho 329.

fertilizer experiments, R.I. 34.

Onion(s)—Continued.

juice and bacterial growth, 603.

mildew, control, [N.Y.]Cornell 769.

muck-land, effect of manganese sulfate on, [N.Y.]Cornell 759.

pest, little-known, 788.

pink root disease on tomatoes, U.S.D.A. 190.

pink root resistance, breeding for, Tex. 771.

smut, control, 628, [N.Y.]Cornell 769.

thrips, breeding for resistance to, Colo. 630.

thrips control tests, Tex. 787.

thrips, notes, [N.Y.]Cornell 786.

thrips on carnations, residual poison sprays against, 645.

thrips, vector of tomato bronze disease, 645.

variety tests, Ga. 44.

wild, seasonal activity of bulbs related to eradication, Ala. 33.

yellow dwarf, in New Zealand, 205.

yellow dwarf, insects as vectors, 205, 364.

Ophiobolus graminis, different strains, reaction of oats to, 632.

Ophthalmia, periodic—

notes, U.S.D.A. 813.

relation to brucellosis, 388, 674.

relation to thyroid activity, 674.

Ophthalmology in equidae, 388.

Opihi, mineral constituents and vitamin content, 412.

Opossum(s)—

albinism in, 172.

parasites of, in Illinois, 641.

pouch young, as experimental material 317.

susceptibility to equine encephalomyelitis, 249.

Opuntia cylindrica, structure of shoot apex, 592.

Orange(s)—

cuttings, rooting, β -indoleacetic acid for, 764.

juice, effect on calcium assimilation, 275.

juice, fresh and canned Florida Valencia, characteristics of petroleum ether extract, 732.

mal secco in Brazil and Argentina, 778.

refrigeration, in transit, U.S.D.A. 756.

rot in storage, 200.

scab, in Uruguay, 778.

trees, Valencia, relation between leaf, branch, and root systems, 54.

Valencia, granulation after picking, 337.

Valencia, dodder on, 636.

vitamin C potency, effect of maturation and cold storage, 564.

Washington Navel, density of stomate and oil glands and water spot in rind, 66.

Washington Navel, fertilizer experiments, 336.

wines, improvement, P.R. 582.

Orchard(s)—see also Fruit(s), Apple(s), Peach(es) etc.

care in summer and fall, Miss. 48.

Orchard(s)—Continued.

- cover crops, cost and yield of varieties, 332.
 - crops, effect of heavy applications of dusting sulfur, 619.
 - fertilizers, rootstocks, and mulches, breeding, Colo. 617.
 - grass, hay and seed yields, effect of ammonium sulfate on, Idaho 319.
 - grass seed, analyzing for purity, comparison of regular methods, 470.
 - harmful effects of continuous cultivation, Pa. 471.
 - heaters, operation of, Calif. 680.
 - insect and rodent pests, control, 73, 74.
 - insect pests, control, 78.
 - management, Miss. 760.
 - sites, frost-free, value of selecting, Pa. 471.
 - soil, management, Ind. 185 N.Y. State 618, Okla. 757, Utah 758, W. Va. 758.
 - soil moisture in, seasonal fluctuations, [N.Y.] Cornell 761.
 - trees, fertilizer requirements, in Hudson River Valley, N.Y. State 618.
- Orcelimum* sp., egg parasites of, 505.
- Orchid(s)—
- baskets, treefern fiber for, P.R. 618.
 - germination, [N.Y.] Cornell 765.
 - nutritional studies, Ohio 765.
 - thrips, U.S.D.A. 784.
- Organic compounds, insecticidal effects, 650.
- Organic matter in soil—
- effect of cropping practices, S. Dak. 735.
 - effect of green manure crop management, 177, 590.
 - effect of pastures and cultivation, Ga. 34.
- Organisms—see also Bacteria and Micro-organisms.
- aquatic, use of solar energy by, 595.
- Oriental beetle, parasites of, U.S.D.A. 503.
- Ornamental plants, shrubs, and trees, see Plant(s), Shrub(s), and Tree(s).
- Ornithodoros*—
- spp., vectors of relapsing fever, 794.
 - turicata* in California, 794.
 - turicata*, infected colony, propagation, ticktorium for, 226.
 - turicata*, persistence of *Rickettsia diporica* in tissues of, 393.
- Oryzaephilus surinamensis*, see Grain beetle, saw-toothed.
- Osmotic measurements, simplified method for, improvements in, 163.
- Osteomalacia, effect of vitamin C on calcium, phosphorus, and nitrogen metabolism in, 711.
- Osteoporosis in horses, diagnosis, 250.
- Ostertagia*—
- circumcincta* in sheep and anthelmintics against, 818.
 - larvae, third stage, accessibility to grazing animals, 816.
 - ostertagi*, phenothiazine as anthelmintic for, 396.
- Otter, Panama, helminth parasites of, 214.

- Ovarian dysfunction caused by diet, inadequacy of vaginal smear in as index, 175.
- Ovaries at different stages of development, auxin content, 16.
- Ovulation—
- cyclic, and corpus luteum formation, restoration in rats exhibiting persistent oestrus, 460.
 - in rabbit, induced by copper acetate and other drugs, mechanism, 609.
 - inhibition, role of testosterone propionate in, 460.
 - production in rabbits before and after transection of hypophyseal stalk, 609.
 - production in rabbit by intravenous injection of salts of copper and cadmium, 174.
- Ovulinia azaleae*, notes, U.S.D.A. 67.
- Owl, great horned, and its prey in north-central United States, Iowa 356.
- Oxalic acid in food, behavior and fate, 277.
- Oxidation-reduction studies, Ariz. 13.
- Oxya sinensis*, intermediate host of gizzard worm, 533.
- Oxygen, determination in milk, [N.Y.] Cornell 806.
- Oxytenia acerosa*, poisonous to livestock, Colo. 668.
- Oxyuris equi*, test of phenothiazine against, 531.
- Oysters—
- analyses, Me. 694.
 - studies, N.J. 783.
- Oystershell scale—
- control, N.Y. State 642.
 - Illac form, control, N.Y. State 642.
- Pachystethus lucicola* in Saratoga Forest Tree Nursery, 651.
- Palm-kernel—
- meal, value for pullets, 381.
 - oil, South American, U.S.D.A. 725.
 - Washington, bud rot of, Ariz. 59.
- Pandanus* tree, *Diatraea pandanace* injury to, 505.
- Panicum obtusum*, seed germination, 43.
- Pansies, requirements for soilless culture, Ohio 765.
- Pantagmus*—
- godmani*, see Rose beetle, Fuller's.
 - leucoloma*, see White-fringed beetle.
 - peregrinus*, biology, 494.
 - taeniatulus*, biology and habits, 494.
- Pantothenic acid—
- bacterial assay method for, Wis. 693.
 - effect on yeast growth, 22.
 - nutritional significance, 506.
 - relation to dermatitis of rat, 851.
 - review, 373.
- Papain, crystalline, anthelmintic activity, 103.
- Papaya—
- culture in Florida, Fla. 624.
 - respiration, at high temperatures, effect of relative humidity, 624.
 - utilization, Tex. 758.
- Paper—
- industry, bacteriology in, 455.

Paper—Continued.

- milk containers, value of antioxidants for treating, Pa. 517.
pots, copper resinate treatment for, 472.
Papilio larvae, choice of food plants, 792.
Papilloma, cutaneous, in cattle, transmission, 304.
Paralysis—
 chastek, of foxes, prevention, Wis. 669.
 curled-toe, effect of riboflavin supplements, 510, 514.
 fowl, iritis as manifestation, inherent resistance of White Leghorns to, 668.
 fowl, studies, 389, U.S.D.A. 813.
 fowl, transmission, 821, Ind. 243.
Parascaris equorum in horses on vitamin A-deficient diet, greater susceptibility to 675.
Parasetigena segregata, life history, habits, and abundance, 788.
Parasites—
 animal, efficiency of phenothiazine against, 389.
 animal, in Kedah, 641.
 animal, thermal death points, apparatus for determination, 496.
 animal, treatment for removal, U.S.D.A. 813.
 gastrointestinal, bovine, immunity to, 394.
 helminth, and parasitic diseases of sheep in Canada, 528.
 hymenopterous, from India, descriptions, 789.
 intestinal, in horses, paratyphoid infection following treatment, 397.
 obligate, cultural separation of, 59.
 of bovines in Northeastern States, 668.
 of domestic animals from Formosa, catalog, 214.
 worm, in market lambs, control, 396.
Parasitology—
 clinical, treatise, 100.
 illustrated laboratory manual, 789.
 introduction to, 523.
 preparation of papers for publication in, 101.
 veterinary, use of phenothiazine in, 817.
Paratetranychus—
 oltri, see Red mite, citrus.
 ticks, distribution and food plant records of, U.S.D.A. 785.
 pilosus, see Red mite, European.
 ununguis, notes, Ga. 75.
Parathyroid extract, effect on blood calcium of fowls, 513.
Paratriosa cockerella, see Tomato psyllid.
Paratuberculosis, see Johne's disease.
Paratyphoid—
 bacilli, multiple types in infections of fowls, 821.
 in chinchilla, 398.
 in horses, following treatment for intestinal parasites, 397.
 in pigeons agglutination test for detection, N.J. 813.
Parcoblatta pennsylvanica, biology, Ind. 361.
Paria canella as nut pest, 370.
Paria canella, notes, Mont. 786.
Paris green v. pyrethrum emulsion as anopheline larvicides in Georgia, 220.
Paisley, vitamin C in, 136.
Parsnips, ascorbic acid in, 423.
Parsnips, vitamin C in, 1:5.
Parthenocarp, induced, in horticultural crops, 617.
Partridges, Chukar and Hungarian, in America, 213.
Pasimachus sp., feeding habits, 503.
Passalurus ambiguus, parasite of rabbit, 72.
Passion-vine brown spot in New Zealand, 211.
Pasteurization, see Milk and Cream.
Pasture(s)—see also Grass(es), Grassland, and Meadow(s).
 and range utilization, U.S.D.A. 794.
 and woodland combination, studies, Tex. 753.
 bluestem, deferred grazing of, Kans. 465.
 botanical composition, relation to soil fertility, W.Va. 754.
 comparative returns from sweetclover, alfalfa, and Sudan grass, S.Dak. 806.
 conservation and improvement, Vt. 158.
 economy of, Ind. 256.
 fertilization, 819, Okla. 752.
 fertilization, returns from, N.J. 805.
 fertilizer experiments, Tex. 753, Utah 753.
 grasses, see Grass(es).
 herbage, effect of fertilization on production and composition, Ga. 34.
 improved, carrying capacity, Tex. 753.
 improvement, W.Va. 807.
 improvement and management, Tex. 753.
 improvement, increase under experimental program, W.Va. 828.
 improvement with borax and lime, Vt. 158.
 in Bluestem region of Kansas, grasshopper populations, 498.
 irrigated, sheep v. hogs on, S.Dak. 795.
 literature, abstracts of, U.S.D.A. 465.
 management, N.H. 322.
 mixtures, variety tests, Idaho 319.
 of Union of South Africa, nutritive value, 372.
 permanent, for Piedmont section of Georgia, 178.
 permanent, practices for, Ga. 321.
 plants in Florida, environmental factors related to growth, 178.
 response to fertilizer and manure, Pa. 464.
 returns, effect of soil management, W.Va. 736.
 studies, 228, Ga. 34.
 supplementary, cereals for, comparison, R.I. 34.
 types, grazing value, U.S.D.A. 662.
 weeds, studies, 329.
 winter clover, for Florida, Fla. 613.
Patellariaceae, studies, 741.
Patents, foreign and domestic, relating to insecticides, abstracts of, U.S.D.A. 494.

Pea(s)—

aphid—

- derris dust mixture against, value of peanut oil in, 364.
- factor in reducing vetch seed yield, Ala. 73.
- in eastern Virginia, control, 80.
- insecticides for control, N.Y.State 642.
- on canning peas, effect of alfalfa on abundance, Wash. 363.
- studies, 789, U.S.D.A. 784, Utah 787.
- vector of narcissus mosaic, 642.
- Austrian, seed germination and growth, effect of fertilizer placement, Miss. 34.
- Austrian Winter, breeding and selection for disease resistance, Ga. 60.
- canning, cultural and harvesting practices, Utah 758.
- canning, development of new varieties, Idaho 329.
- canning, new seed protectant for, 629.
- canning, returns from, Wis. 682.
- cooked or home-canned, quality and vitamin content, Mont. 122.
- diseases, seed-borne, problems of, N.Y. State 202.
- English, yields more than doubled by seed treatment, Miss. 46.
- frozen, appraisal of quality in, Utah 836.
- Fusarium*, foot rot, N.Y.State 630.
- hard-shell seeds in, 469.
- inoculation studies, 187.
- low germination associated with bacteria in seed, 59.
- near-wilt resistance, breeding for, Idaho 342.
- planting machinery, [N.Y.]Cornell 826.
- pod meal and broad bean pod meal, composition and nutritive value for ruminants, 229.
- promotion of germination by chemical treatments, Idaho 319.
- rhizosphere of, microbial population in, 447.
- roots, isolated, specificity of nicotinic acid as growth factor, 305.
- seed treatment, N.Y.State 630.
- seed treatment, and bacteria causing poor germination, Idaho 342.
- seed treatment with chemical dusts, 484.
- varieties for freezing storage, selection, Okla. 757.
- variety tests, Pa. 472.
- vitamin values preserved by frozen-pack method, 418.
- weevil, control, 653, 789, Idaho 357, U.S.D.A. 784.
- weevil, insecticides for control, N.Y. State 642.
- weevil, mechanized dusting for, Idaho 399.
- weevil, rotenone-containing dusts for, tests, Idaho 357.

Peach(es)—

- aphid, green, on cabbage, auxinic activity, 628.

Peach(es)—Continued.

- aphid, green, vector of sugar beet yellows virus, 65, 365.
- aphids, studies, 217.
- borer, life history, in Ontario, 218.
- borer, notes, N.J. 786.
- borer, use of ethylene dichloride for, U.S.D.A. 783.
- breeding, N.J. 761, Utah 758.
- brown rot, N.Y.State 630.
- canker due to *Fusicoccum amygdali*, 628.
- catechol tannin in fruits, N.J. 761.
- chromosomal variations in, N.J. 761.
- cold requirements, 191.
- constriction disease, 352.
- crown gall, protection of seedlings from, U.S.D.A. 768.
- diseases in Ozark section of Arkansas, U.S.D.A. 769.
- diseases in Washington, U.S.D.A. 199.
- Elberta, blooming date in 1940, N.J. 761.
- embryo and fruit development, N.Y. State 618.
- embryo and fruit, growth and development, effect of ringing and defoliation, 334.
- fertilizer demonstration results, 621.
- freestone varieties, canning qualities, Colo. 693.
- identification of varieties by leaf characteristics, 52.
- improvement and outstanding seedlings, 760.
- leaf-casting yellows disease, 212.
- leaf curl, N.Y.State 630.
- leaf curl, origin of outbreaks, U.S.D.A. 59.
- leaf injuries by spray residues, wart disease, and leaf spot, Idaho 342.
- marketing, use of motor trucks in Illinois for, 408.
- maturity and storage studies, 334.
- mosaic eradication, 480.
- mosaic in western Colorado, 210, 627.
- mosaic, studies, Colo. 630, U.S.D.A. 783.
- new varieties, Pa. 471.
- new virosis resembling X disease in Utah, 629.
- nursery stock, *Physalospora obtusa* on, U.S.D.A. 768.
- orchards, cover crops for, Ga. 474, Pa. 471.
- orchards, fertilizers for, Ga. 474.
- orchards, protecting from X disease, 66.
- orchards, sod as prevention of erosion in, Pa. 471.
- phony disease, tests for vectors, U.S.D.A. 783.
- pits for growing seedlings, sources, N.Y. State 618.
- pollen, longevity, 47.
- production, relative effect of nitrogen derived from different sources, Del. 191.

Peach(es)—Continued.

- Redhaven, Mich. 621.
 respiration and maturity in, 762.
 response of trees in sand culture to varying amounts of N, K, and P, 621.
 response of trees to potassium, 620
 roots, growth, Ga. 44.
 rootstocks, notes, N.J. 761.
 rootstocks, testing, Ariz. 44.
 rusty spot, U.S.D.A. 768.
 seedling rootstocks, transplanting shock in, effect on size of nursery and orchard trees, 833.
 shot hole, 779.
 shot hole, overwintering in peach buds, 628.
 spraying experiments, Pa. 475.
 trees, cold injury to, Ga. 60.
 trees, crown injury in New York, U.S.D.A. 59.
 trees, dinitrophenol compounds to break rest period in, 475.
 trees, fertilizers for, Ark. 617.
 trees in nursery row, summer pruning, 475.
 trees, methods of applying potassium to, N.J. 761.
 trees, transplanting, methods, Okla. 757
 trouble, new, resembling X disease, 480
 twig borer, Utah, 787.
 Vales canker, status in New Jersey, N.J. 769
 varieties, Ark. 617.
 varieties, classification, N.J. 761.
 varieties, new, introduction, U.S.D.A. 756.
 variety tests, Ga. 44.
 winter injury, relation to soil management, W.Va. 758.
 Winters disease, 480.
 X disease, (yellow-red virosis)—
 first appearance in the State, R.I. 60.
 in 1940, U.S.D.A. 630.
 spreading in Utah, U.S.D.A. 630, Utah 635.
 status in New Jersey, N.J. 769.
 studies, 66, 352, 486, Conn.[New Haven] 480, N.Y.State 630, Utah 771.

Peanut(s)—

- and peanut meal for swine feeding, Ga. 89.
 breeding, Ga. 33, Tex. 753.
 breeding and selection, Ga. 59.
Cercospora leaf spot, sulfur dust for control, 628.
 diseases in Texas, U.S.D.A. 629.
 hay v. silage for fattening cattle, Ga. 89.
 hay, value for wintering breeding cows and for fattening steers, Ala. 88.
 hulls, ground, for promoting growth of tobacco seedlings, U.S.D.A. 751.
 hulls v. other organic materials for use in greenhouse soils, Ala. 44.
 large-seeded Virginia-type, effect of mass selection, 39.

Peanut(s)—Continued.

- leaf spots, sulfur dust for control, Ga. 60.
 meal v. cottonseed meal for fattening cattle, Ga. 80.
 meal, value for pullets, 381.
 microscopical studies, Ga. 6.
 oil in derris dust mixtures against the pea aphid, 364.
 production, Miss. 39.
 response to inoculation with *Rhizobia*, 447.
 seed treatment, effect on germination and yields, Ga. 60.
 Pear(s)—
 Bartlett, effect of carbon dioxide in lengthening life, 191.
 fruit set, factors effecting, Vt. 185.
 pollen, longevity, 47.
 psylla, Mont. 786.
 scab, 779.
 situation, world, production and trade, U.S.D.A. 543.
 stony pit virus, 58.
 stony pit at Hood River, 486.
 thrips, control with dichloroethyl ether, 74.
 tree buds, breaking dormancy with glutathione, 16.

Peat—

- and its uses, N.J. 157.
 native, effect in rose culture, Pa. 471.
 nicotine, sticker used with, 360.
 resources of Connecticut to replace imports no longer available, Conn.[New Haven] 442.
 soils, zinc toxicity in, [N.Y.] Cornell 735.

Pecan(s)—

- composition of shell, 727.
 groves, culture, Okla. 757.
 groves, results of three years' treatment for root rot, 58.
 hickory shuckworm on, control and parasites of, U.S.D.A. 783.
 indicators of maturity, Ariz. 44.
 insects, Tex. 787.
 leaf casebearer, U.S.D.A. 783.
 leaf scorch studies, 211.
 nut casebearer, insecticide tests for control, U.S.D.A. 783.
 nut casebearer, pecan foliage as food for, 218.
 transplants, rooting, U.S.D.A. 756.
 transplants, treatment with indole-3-butyric acid, U.S.D.A. 756.
 varieties, comparative ease of cracking, Okla. 757.
 yield of varieties and filling of nuts, Ariz. 44.

Pectic substance in cotton fibers, relation to growth, 451.

Pectin(s)—

- and texture of cooked potatoes, 839.
 in plant material, criticism of recent paper on, 309.

Pectinophora gossypiella, see Bollworm, pink.

- Pellagra**—
 and nicotinic acid in cereals, 708.
 cause, 709.
 producing diet, Goldberger, multiple deficiencies of, Wis. 693.
 relation to nicotinic acid, 851.
Pemphigus durarius, notes, Mont. 786.
Pemphigus spirothecae, biology, 788.
Pentiothium roquesforti—
 growth, effect of various concentrations of carbon dioxide, 240.
 oxygen requirements in presence of nitrogen as diluent and absence of carbon dioxide, 240.
Pentophora gigantea, effect on strength of southern yellow pine sapwood, 489.
 Pennsylvania College, notes, 432.
 Pennsylvania Station, notes, 432.
 Pennsylvania Station, report, 576.
Pentilia—
castanea, establishment as scale predator, P.R. 640.
oastanea, shipment to Florida and Hawaii for liberation against coconut scale, P.R. 640.
egena, shipment to Florida and Hawaii for liberation against coconut scale, P.R. 640.
 Pentobarbital sodium as anesthetic for minks, 675.
 Pentsimon, new *Ascochyta* on, 772.
 Peony blooms, grading and standardization, Ind. 185.
 Peony root knot, Ohio 68.
Pepper (s)—
 anthracnose, due to *Glomerella cingulata*, 485.
 bacterial disease, [N.Y.]Cornell 769.
 blight due to soil mold, Colo. 774.
 breeding, N.J. 758.
 effect of hardening treatments, W.Va. 758.
 farms, types, cash returns, labor requirements, etc., Ga. 110.
 improvement, Pa. 471.
 intensive production on sandy land, soil management for, Conn.[New Haven] 443.
 mildew or blight due to *Phytophthora capsici* in Argentina, 485.
 pimlento—
 effect of roasting and scalding on planting value of seed, 187, 760, Ga. 44.
 fertilizers for, Ga. 44.
 wilt of, 64.
 yield, effect of date of planting, Ga. 44.
 southern blight, resistance to, Ga. 59.
 spotted wilt outbreak in Pennsylvania, U.S.D.A. 59.
 variety tests, Pa. 472.
 weevil, lesser, biology, importance, and control, 653.
Peppermint—
 oil, variation in composition of different fractions, Ind. 150.
Peppermint—Continued.
 production and marketing on muck, Ind. 185.
 Peptides, synthetic, effect of ultraviolet light on, N.Y.State 582.
 Percule, properties, relation to price, 570.
Pergandea cahuilae n.sp., description, 501.
 Perilla, production tests, Tex. 752.
 Perilla, seed production, P.R. 618.
Periplaneta—
americana, see Cockroach, American.
fuliginosa, biology, Ind. 361.
Peromyscus spp., identification by red blood cell agglutination test, 782.
Peronospora genus in Argentina, 481.
Perosis—
 effect of choline and other supplements on, 803.
 relation to manganese in poultry rations, [N.Y.]Cornell 802.
 relation to unrecognized vitamins, 506.
Persimmon (s)—
 anthracnose, 211.
 Hachiya, cambial activity in, 622.
 mistletoe on, 352.
 Oriental, rootstocks for, 476.
 wilt, notes, 779, U.S.D.A. 59.
 Personnel administration and personnel training, bibliography, U.S.D.A. 268.
Pest control—
 division, University of Florida, 494.
 equipment and methods, U.S.D.A. 823.
 Petrolatum, liquid, effect on carotene in blood of human beings, 848.
 Petsal heart rot caused by *Pythium aphanidermatum*, 60.
Pesica sejournei, systematic study, 311.
 Pesizales, studies, 741.
Phaeogamum, new species, 23.
Phaeociboria, systematic study, 311.
Phaeogenes ater, parasite of peach borer, 218.
Phalaris tuberosa, breeding, Idaho 319.
Phanerotoma grapholithae, egg parasite of oriental fruit moth, U.S.D.A. 502.
Pheasant (s)—
 crippled, losses, Pa. 495.
 egg incubation, effect of temperature, humidity, and air movement, 516.
 genetics of, [N.Y.]Cornell 747.
 nesting habits, Pa. 495.
 ring-necked—
 causes of juvenile mortality, 536.
 in southeastern Minnesota, winter observations, 492.
 mortality, Pa. 495.
 parasites of, in Illinois, 641.
Phellodendron spp., fruit, insecticidal properties, 642.
Phenothiazine—
 as an anthelmintic, 248, 252, 389, 390, 397, 529, 531, 817.
 compounds related to, anthelmintic efficiency, 672.
 effect on ascarid infestation in dogs, 398.
 effect on calves suffering from parasitic gastritis, 817.
 fate, in sheep, 529.
 materia medica of, 817.

- Phlebotomus*, rearing, glass tubes for, 358.
Phlox charcoal rot, U.S.D.A. 59.
Phlugiola dahlmica, rearing, 788.
Phlyctena linicola, notes, Tex. 770.
Pholista adiposa, notes, 351.
Phoma foveata n.sp., description, 630.
Phomopsis—
 fruit rot of tomato, 629.
 sp. fatal to beech near Philadelphia, U.S.D.A. 342.
Phormia regina, laboratory rearing for 200 generations, 83.
Phorocera agilis, life history, habits, and abundance, 788.
 Phosphatase test, reliability, Pa. 517.
 Phosphate—
 catalyst, spent, fertilizing value, 302.
 fixation, salt effect on, 588.
 monocalcium, Idaho 389.
 rock, diacalcium phosphate from, U.S.D.A. 794.
 rock, quenched slag as byproduct from, nature and liming value, 303.
 solubility in Colorado soils, relation to pH, 157.
 Phosphorus—
 absorption by winter legumes, effect of liming, 178.
 and calcium metabolism in Indians on rice and on wheat diets, 416.
 availability, in hay, 506.
 compounds, organic, in soil, isolation of inositol, 158.
 deficient diet, mineral metabolism, growth, and symptomatology of rats on, 126.
 deficiency, effect on protein and mineral metabolism of sheep, 374.
 deficiency in livestock, symptoms, Mont. 373.
 effect on lead in blood and bone, 699.
 fixation, N.J. 735.
 fixation, by Prairie group soils, 301.
 fixation for New York soils, [N.Y.] Cornell 735.
 in blood of normal and mentally diseased men, 846.
 in human and animal health, essentiality and sources, 842.
 in Iowa soil profiles, 301.
 in *Lespedeza sericea* and alfalfa hay, availability to white rats, 657.
 in soybean and red clover hays, availability to white rats, 657.
 lateral movement in orchard soil, 50.
 metabolic balance, in Eskimo children, 554.
 metabolism in musculature of dystrophic vitamin E-deficient rats, 228.
 metabolism in rats and dogs, effect of mineral oil ingestion, 848.
 removed from Alabama soils, 178.
 retention by preschool children, 552.
 supplements for livestock, methods of feeding, 373.
 use by crops, importance of calcium in, 179.
 yellow, toxicity to cockroach, 498.
Photinia, Chinese, citrus thrips damage to, 645.
 Photometer, photoelectric, Ind. 150.
 Photomicrography in mycological research, 744.
 Photoperiodic response of plants, U.S.D.A. 309.
 Photosynthesis—
 and chlorophyll pigments, Ind. 150.
 and fluorescence, course of, 25.
 and fluorescence, time course observed simultaneously, 25.
 and oxidation reactions in green plants, relation, 17.
 in horticultural plants, environment-control chamber for study, 164.
 studies, 598.
 studies with *Chlorella pyrenoidosa*, use of dropping mercury electrode in, 16.
 Phthiocol, oral and parenteral toxicity, 567.
Phycomyces—
 blakesleeianus—
 extracts, effect on its development, 305.
 synthesis of thiamin and biotin by, 305.
 zygospore formation in, 596.
 effect of potato extracts on growth, 305.
Phycomycetous fungi from soil, quick method of isolating, 481.
Phyllocoptes—
 destructor n.sp., description, 655.
 oleivorus, see Citrus rust mite.
 Phylloidy in varieties of tomatoes and beans, morphological and anatomical features, 776.
Phyllonorycter n.sp. on *Tephrosia*, P.R. 640.
Phyllophaga—
 flight records, 793.
 hirticollis, notes, Ind. 212.
 lanceolata, notes, Okla. 786.
 spp. in newly set strawberries, arsenicals for control, 85.
Phyllosticta—
 sp. on apple angular leaf spot, 635.
 swietenia n.sp. causing mahogany seedling blight in Puerto Rico, U.S.D.A. 638.
Phymatotrichum omnivorum—
 resistance of plants to, chemistry of, 683.
 root rot in pecan groves, results of treatment, 58.
 root rot research, Ariz. 59, Tex. 770.
Physaloptera sp., parasite of raccoon, 783.
Physalospora obtusa on peach nursery stock, U.S.D.A. 763.
Phytalus smithi control, search for parasites of, 369.
 Phytohormones, effect on seed germination, N.Y.State 618.
Phytomonas—
 gardeniae n.sp., notes, 779.
 juglandis and filbert blight pathogen, comparison, 67.
 pruni, overwintering in peach buds, 628.
 sepedonica, bactericidal efficiency of chemicals against, 627.
 sepedonica, notes, 206.

Phytomonas—Continued.

stewartii strains, agglutination test applied to, 483.

stewartii strains, agglutinin absorption by, 484.

tumefaciens, carbon metabolism, factors affecting, 772.

tumefaciens, notes, 201.

tumefaciens, production of secondary tumors in sunflower by, 776.

Phytomyza—

ilicicola, see Holly leaf miner.

ilicis, parasites, establishment in British Columbia, 642.

Phytopathology, history of development in Brazil, P.R. 771.

Phytophaga destructor, see Hessian fly.

Phytophthora—

cactorum of hardwoods, tree injection for control, 628.

cactorum on maple and beech, R.I. 60.

capsici, hosts of, 347.

capsici isolates, sexual phenomenon exhibited by, 343.

capsici on important truck crops, Colo. 774.

disease of Norway maple, N.J. 769.

erythroseptica, synthesis of biotin by, 305.

fragariae n.sp., cause of red core root disease, 773.

infestans—see also Potato blight, late. on tomato leaves, 351.

pink rot and wilt of potato, U.S.D.A. 59.

unidentified sp. on Dutch iris, 636.

verrucosa n.sp., description, 630.

Phytoplankton, relation to limnology and aquatic biology, 595.

2-phytyl-1,4-naphthoquinone, synthesis, 728.

Pickle sweeteners, comparison, 733.

Pickleworm, rotenone dusts for control, 494, 648.

Pieris—

canidia, destructive pest in Hong Kong market gardens, 73.

rapae, biology, population density, etc., 792.

Pig(s)—see also Sows and Swine.

and dairy farming in northeastern Iowa, Iowa 404.

bacon, form and composition, effect of plane of nutrition, 378.

bacon, growth rate and carcass quality, statistical analysis, 509.

bacon, restricted feeding experiment, 509.

breeding and selection for commercial types, relation of environmental conditions, 231.

brooders, electric, Ind. 253, Oreg. 109.

calcium requirements, on rations with cottonseed meal, Tex. 796.

carcass quality characters, 377.

carotene in dry-lot ration cuts cost, Okla. 795.

Chester White, litter size in, effect of inbreeding, U.S.D.A. 172.

composition and synthesis of fat in, effect of planes of nutrition, 379.

Fig(s)—Continued.

composition of bones from left and right sides, W.Va. 796.

crossing and selecting, U.S.D.A. 747.

depot fats, composition, effect of prolonged fast, 660.

dried whey powder in rations for, 93.

economical production, transmission of factors related to, Ala. 88.

effect of kinds of fat in ration on character of fat formed, Ind. 227.

effect of protein in sow's ration, Okla. 795.

effect of type and finish on carcass and product grades, Ind. 227.

fattening—

comparison of protein mixtures for, Ind. 227.

concrete wallows for, Tex. 796.

grinding barley for, Okla. 795.

oat pasture for, Tex. 796.

optimum protein levels for, Pa. 507.

protein supplements to corn for, Okla. 705.

rations, comparison, Ark. 655, S.Dak. 795.

feeding, U.S.D.A. 794.

feeding experiments with distillery slops, Ky. 376.

feeding, inadequacy of concentrates commonly used, Mo. 376.

feeding, saving and drying kitchen waste for in Great Britain, 798.

feeding soybeans to, effect on gains and method of producing firm carcasses, N.C. 659.

forage crops for, comparison, Mont. 656.

gestation period in, 800.

grain-fed and garbage-fed, carcass studies, 231.

husbandry, coordinated experiments in, 231.

identification by tattooing, 658.

index of purchasing power, N.Dak. 537.

industry in Argentina, U.S.D.A. 256.

management, N.J. 659.

market classes and grades, U.S.D.A. 659.

newborn, death loss in, Ind. 243.

parasites of, treatment for removal, U.S.D.A. 813.

plan of economical production for Coastal Plain area, Ga.Coastal Plain 659.

Poland China, comparison of large-, medium-, and small-type, U.S.D.A. 794.

prices, guideposts for farmers' analysis, Okla. 256.

production in South, textbook, 231.

production in western Canada, 92.

protein and vitamin supplements for, [N.Y.] Cornell 795.

protein levels for, Pa. 508.

rations, in dry lot and on pasture after weaning, S.Dak. 795.

reduced mortality, by use of posterior pituitary solution during parturition, N.J. 794.

Fig(s)—Continued.

- selections, difficulties of making, Okla. 747.
- superior strains, development, Mont. 656.
- vitamin A requirements, 376, Tex. 796.
- vitamin D requirements, 476.
- vitamin deficiency symptoms in experimental herd, 231.
- year-round grazing and hogging-off program for, 226.
- young, thiamin requirement, 800.

Pigeonpeas, production tests, Tex. 752.

Pigeons—

- breeding, progeny testing, 511.
- inexpensive ration for, N.J. 794.
- maintenance nutrition in, 282
- on vitamin B-deficient diet, intestinal yeast flora of, 223.
- vagrant domestic, control, 213.

Pigment production in bird feathers, effect of X-rays, 749.

Pimientos, see Pepper(s).

Pimplini of eastern North America, revision, 506.

Pine beetle—

- outbreaks, prevention under war-time conditions, 793.
- southern, attacking pine, infection by *Ceratostomella pini* following, 354.
- southern, etiology of *Beauveria* disease, 781.
- western, U.S.D.A. 784.

Pine—see also White pine.

- blister rust, see White pine blister rust.
- blue stain, effect on specific gravity and strength of wood, 490.
- brown-spot needle disease, 638.
- butterfly, effect of defoliation of ponderosa pine by, 647.
- direct seedling in southeastern Piedmont region, 340.
- dying, infected with blue-stain fungus, 854.
- effect of artificial defoliation, 626.
- geometrid, biology, 788.
- geometrid larvae fed on pine needles from pure stands and from mixed forests, mortality and growth, 788
- grafting, tested methods of, 479.
- leaf scale, control, N.Y.State 642.
- loblolly, fiber length, effect of position within bole, 787.
- longleaf, seed trees, increased growth after release cutting, 340.
- multiple seedlings of, 478.
- natural establishment, in abandoned fields, 625.
- needle cast disease, 637.
- nursery stock, effect of high rate fertilizer treatments on survival and growth in field, 479.
- ponderosa, insect-killed, entomological considerations in salvaging, 370.
- ponderosa, seedlings, to development and transpiration, effect of soil temperature, Vt. 197.
- ponderosa, shade effects in, 480.

Pine—Continued.

- seed, extracting from fresh and stored cones, kiln schedule for, 198.
- seed germination, water requirements, 625.
- seed, large scale extraction, laboratory tests as applied to, 197.
- seed, southern, successful storage for seven years, 108.
- seed treatment, growth substances of doubtful benefit for, 340.
- shoot moth, European, in British Columbia, 642.
- slash, reforestation, Tex. 757.
- slash, survival and growth from different grades of planting stock, Ala. 56.
- southern, fusiform rust of, U.S.D.A. 768.
- trunks, fungi in, and relative susceptibility of artificial and natural stands, 629.

Pineapple(s)—

- caterpillar control, 501.
- early fruiting, ethylene as stimulus to, U.S.D.A. 756.
- juice, fresh, anthelmintic activity, 102, 103.
- nutrient requirements, P.R. 618.
- smoking to induce blooming, P.R. 618.

Pinewood soil, fungi isolated from, 202.

Pinitol, isolation, 523.

Pinus strobus cuttings, rooting, changes induced by indole acetic acid in, 17.

Piperidine, concentration-mortality curves for solutions toxic to eggs of *Lygaeus kalmii*, 380.

Pipette—

- automatic zero, for dispensing sterile culture media, 603.
- spatulate, serving as section lifter, 13.

Piroplasmosis—

- atcaprin in treatment, 672.
- canine, sulfanilamide in treatment, 398.

Piscidia piscipula, toxicity tests, P.R. 640.

Pistillaria n.sp., on rice straw, 311.

Pistol casebearer—

- control, Pa. 495.
- parasites of, 357.

Pittosporum—

- angular leaf spot, 354.
- daphniphyllodes*, probable virus disease of, 637.
- tobira disease, suggestive of virus etiology, 480.

Pituitary (ies)—

- anterior
 - effect on molting in birds, 462.
 - extract, effect on energy and protein metabolism, Pa. 507.
 - extract, effect on spermatogenesis in rat, 608.
 - extract, in growing chicks, effect, 510.
 - hormone, effect of picric and flavianic acids on potency, 318.
 - hyperfunction in rats, 609.
 - second mammo-genic factor in, 611.

Pituitary (ies)—Continued.

anterior—continued.

species variation in thyrotropic, gonadotropic, and prolactin activities, 80.

cell types in rat, following administration of antigonadotropic serum, 817.

extract injection, induction of fertility in ewes by, 609.

from pregnant cows, gonadotropic action, 458.

gland and carbohydrate metabolism, 697.

gonadotropic hormone in, restitution, relation to diet, 29.

of rat—

changes in gonadotropic complex following removal of testes, 749.
experimental transplantation, 461.
mamogenic factor in, evidence for, 176.

posterior, substances, effect on premature expulsion of eggs by hens injected with, 510.

Plagiodera versicolora in New England, 652.

Plague in United States, 392.

Planera, susceptibility to *Ceratostomella ulmi*, 629.

Planetree—

Ceratostomella disease, spread by pruning, U.S.D.A. 768.*Ceratostomella*, transmission in asphalt wound dressings, 629.disease due to *Ceratostomella*, 639.

disease, spread and seriousness, 212, 779.

Planning board activity, State, fields of, 259.

Plant(s)—see also Flora and Vegetation.

ability to absorb native potash from soil, Ind. 179.

aging, relation to fertilizers, Vt. 200.

alien, growing without cultivation in California, Calif. 594.

and soil micro-organisms, interaction, 447.

aquatic, manual, 158.

breeding, colchicine as tool, N.Y.State 617.

breeding for disease resistance, problems in, 485.

breeding for insect resistant crops, 358.

breeding programs, quick testing of nematode resistance in, U.S.D.A. 489.

bug, rapid, insecticides for, tests, 78.

bug, Say's, U.S.D.A. 784.

bug, southern green, feather-legged fly as parasite, 650.

buds, grass, Mont. 786.

buds in citrus groves, 646.

cell membranes, structure and composition, 600.

chromosomes, see Chromosome(s).

coccids on roots in Egypt, 647.

cold resistance in and chromosome complement, 604.

collectors, method for determining and specifying locality by, 593.

communities, major, on a transect through western Oregon, 592.

Plant(s)—Continued.

cultivated, in indigenous flora of Argentina, 593.

culture, effect of vitamins and other chemicals, 829.

culture in cinder and gravel for greenhouse flowering, 104.

culture in fluid media, test of availability of adsorbed ions to, 806.

culture in nutrient solutions, treatise, 25.

culture without soil, 25, R.I. 164.

cuttings—

response to treatment with naphthyl acids and their potassium salts in a talc carrier, 380.

rooting, effect of hormodin A on, Iowa 471.

rooting, effect of growth-promoting substances, U.S.D.A. 757.

soil as rooting medium for, 758.

stimulating root development in, with growth-promoting substances, Pa. 471.

cytology, paraffin method in, 744.

deep-rooted, root growth of, in limestone soils, W.Va. 736.

deficiencies, method of diagnosing, 741.
desert, see Desert.

disease(s)—see also Fungi and different host plants.

and breeding work, progress, Ind. 199.

and pests in Bermuda, 200.

and weather, 585.

control by crop rotations, U.S.D.A. 768.

data in complex factorial designs, problems in handling and interpreting, 630.

due to soil-borne pathogens, relation to microflora of rhizosphere, 202.

greenhouse, control, [N.Y.]Cornell 769.

host-parasite check list revision, U.S.D.A. 59, 199, 342, 630, 768.

important, in 1939, Tex. 770.

important, not previously known in Philippines, 60.

in Brazil, first notices of, P.R. 771.

in Espirito Santo, Brazil, preliminary list, 342.

in Massachusetts, U.S.D.A. 199.

in Santa Fe, Argentina, 200.

in Scotland, new fungi causing, 630.

insect transmission, 57, 496.

new and interesting, 200.

notes, R.I. 60.

plasmodesmata and inclusion in guard cells, problem, 600.

seed-borne, problems of, N.Y.State 202.

situation in Massachusetts in 1940, and weather, U.S.D.A. 768.

summary of causes, 480.

survey for Georgia, 769.

survey of Canada, 771.

Plant(s)—Continued.

disease(s)—continued.

- Survey, work of, U.S.D.A. 768.
- treatise, 58.
- virus, acquired immunity from, 481.
- virus, affecting legumes, identification, 681.
- virus, morphogenetic aspects, 481.
- virus, technics of study, 202.
- ecological array, calcium-potassium-phosphorus relation as factor, 301.
- effect of isotopic nitrogen, Conn.[New Haven] 437.
- embryo, nitrogen metabolism of, 450.
- ericaceous, propagation, [N.Y.]Cornell 765.
- extracts, inhibitor in, relation to growth substance content and output in plants, 743.
- fish-poison, testing for insecticidal value. U.S.D.A. 756.
- flower development, relation to mineral nutrients, 449.
- flowering—
 - culture, gravel-nutrient system for, Okla. 757.
 - diploidy, polyploidy, and winter hardiness relations in, 171.
 - effect of vitamin B₁ on development, 451.
 - use of organic materials in preparing soil for, [N.Y.]Cornell 765
- galls and gall makers, 497.
- green, hydrogen assimilation in, 16.
- green, oxidation reactions and photosynthesis in, relation, 17.
- greenhouse, effect of daily photoperiod increase on growth, [N.Y.]Cornell 765.
- greenhouse, insects affecting, 642.
- greenhouse, methods of watering, [N.Y.] Cornell 765.
- growth—
 - and soil reaction, 34.
 - and tropisms, new research on, 448.
 - as index of soil fertility, Pa. 442.
 - effect of boron on, N.J. 735.
 - effect of daily variation of temperature, 599.
 - effect of light of different wave lengths, 16.
 - effect of soil pore space, Okla. 735.
 - effect on character of bacterial flora, 302.
 - harmful effect of direct and alternating currents on, 161.
 - regulation, 741.
 - relation to vitamin B₁, 22.
 - response to riboflavin and ascorbic acid, 20.
- growth substances—
 - and heterosis, 17.
 - effect on development of inserted buds, N.Y.State 618.
 - effect of dust treatment of seeds with, 596.
 - extraction from tissues, difficulties encountered in, 19.

Plant(s)—Continued.

growth substances—continued.

- for control of apple drop, 50.
- relation to mechanism of action of radiation on plants, 17.
- relation to one another and to plant metabolism and growth, 743.
- role in regeneration of root cuttings, 453.
- hardiness map for United States, U.S.D.A. 769.
- herbaceous, in two types of forests in central Indiana, phytosociological study, 447.
- heterozygous, inbreeding experiments, Conn.[New Haven] 47.
- histology, rapid staining methods in, 310.
- hormones, *see* Plant growth substances.
- house, Iowa 104.
- improvement, new application of chemistry to, 20.
- indicator, use for locating seleniferous areas, 307.
- insecticidal, U.S.D.A. 784.
- invading overgrowths in, experimental production, 628.
- loop method of dwarfing, and inducing flowering, 332.
- marine, auxin in, 20.
- materials, gonadotropic activity, U.S.D.A. 662.
- materials, pectic content, criticism of recent paper on, 309.
- materials, sugars in, determination, Shaffer-Somogyi reagent for, 729.
- materials, testing, P.R. 618.
- medicinal, *see* Drug plants.
- meristems, two types, problem of, 453.
- mineral uptake, effect of ringing and of transpiration, 449.
- minor nutrient elements for, millorganite as source, 592.
- names, new pronouncing dictionary, 740.
- native, adaptability for bees, Tex. 737.
- new, introduction, U.S.D.A. 757.
- nucleuses and X-rays, interaction, N.Y.State 618.
- nutrient deficiencies, diagnosis by plant-tissue tests, Ind. 154.
- nutrient deficiency symptoms, physiological basis, 166.
- nutrients, Okla. 735.
- nutrition experiments in greenhouse, factorial design in, Ark. 34.
- nutrition, Liebig and organic, 448.
- of Peru, catalog of common and scientific names, 159.
- of Utah, new and extended ranges of, 446.
- ontogenesis, role of temperature gradient in, 599.
- organs, adventitious, production and inhibition, effect of growth substance vapors, 17.
- ornamental—
 - breeding experiments, Tex. 757.
 - culture experiments, Tex. 757.

Plant(s)—Continued.

- ornamental—continued
 - culture with nutrient solutions, Ohio 765.
 - detrimental effect of walnut to, 211.
 - for Ohio, selected list, Ohio 55.
 - leaf crumpler injury, Tex. 787.
 - propagation, Fla. 624.
 - variety tests, Tex. 757.
- pathogens, bacterial, gram-negative, systematics, 771.
- pathogens in Missouri, annotated list, U.S.D.A. 480.
- pests, control, standardization and uniformity in, 358.
- photosynthesis, *see* Photosynthesis.
- poisonous—*see also* Livestock poisoning and specific plants.
 - as problem in southern livestock production, 226.
 - chemical analyses as aid to classification, 329.
 - in Union of South Africa, toxicity, 101.
 - most important, of South Africa, 329.
 - notes, Colo. 668.
 - of Georgia, 740.
 - to livestock, Ariz. 101, U.S.D.A. 813.
- production of overgrowths on, chemical agents in, 16.
- propagation, vegetative, and regeneration, 19.
- protection, scientific principles, 341, 496.
- protoplasm, physical state, relation to frost resistance, 443.
- resistant or tolerant to root knot nematode infestation, U.S.D.A. 490.
- respiration, *see* Respiration.
- response to length of day, U.S.D.A. 309.
- role of potassium in, 449.
- root systems of, rapid method for excavating, 454.
- rooted aquatic, relation to limnology of fresh-water lakes, 595.
- roots, cation exchange in, relation to metabolic factors, 166.
- rubber-yielding, testing, U.S.D.A. 757.
- selenium-containing, toxicity for control of red spider, 793.
- selenium in, S.Dak. 727.
- sex hormone, trimethylamine as, 17.
- sociological methods, 595.
- species, synthetic, general analyses, N.Y.State 618.
- structure of end walls in differentiating vessels, Calif. 455.
- suspected, feeding tests, Tex. 813.
- tissues—
 - and hydrocarbons, interaction, N.Y.State 618.
 - chlorophyll and carotene in, determination in same sample, Mich. 583.
 - combined fixing, staining, and mounting media for, 453.
 - detection of bivalent tin in, 741.

Plant(s)—Continued.

- tissues—continued.
 - effect of hydrocarbons on, 597.
 - enzymatic liberation of auxin from, 20.
 - glycerin mounts, resins for sealing, 454.
 - in constant gaseous environment, respiratory quotient, measurement, 310.
 - methods of sap expression from, 307.
 - oxidase systems in, 453.
 - staining, 310.
 - staining, rapid double, improved smear methods for, 310.
 - tests, valuable aid to farmers, N.Y.State 590.
 - transpiration, *see* Transpiration.
 - transplanting, application of fertilizer solutions at time of, N.Y.State 618.
 - tropical and subtropical, injury from January 1940 freeze, 335.
 - varietal resistance to insects, [N.Y.] Cornell 786.
 - virus nomenclature, suggestions on, 635.
 - virus proteins, nature and properties, 202.
 - viruses, comparative host ranges, 344.
 - viruses, relation to specific tissues, 202.
 - viruses, sizes of, 202.
 - water, respiration and oxygen requirements, 16.
 - wild, Curculionidae, Bruchidae, Lepidoptera, and their parasites infesting, 643.
 - woody, *see* Woody.
- Plantations of the South, changes in organization, income, living conditions, etc. 834.
- Plasmodesmata and inclusion in guard cells of virus-diseased plants, 600.
- Plasmodiophora brassicae*, *see* Cabbage club-root.
- Plasmodium*—
- from wild birds of Mexico, 214.
 - gallinaceum* in fowl, biology, 534.
 - lophurae*, immunity in chickens against, 534.
 - lophurae* in fowls, biological characteristics, 821.
 - spp., cultivation in duck embryos, 253.
- Plastic(s)—
- as substitute for cover glasses, 18.
 - research, U.S.D.A. 725.
- Platygaster* sp., parasite of willow insects, 225.
- Platyptilia carduidactyla*, *see* Artichoke plume moth.
- Platyssamia cecropia*, *see* Cecropia moth.
- Pleuropneumonia, contagious, of goats, symptoms, pathology, and histopathology, 673.
- Plodia interpunctella*, *see* Indian-meal moth.
- Flow(s)—
- damage, reducing, Pa. 536.
 - experimental, development of reduced-friction surfaces and materials for, Ala. 109.
 - trash shields, Ind. 254.

Plum(s)—

breeding, Utah 758.

curculio—

control, new developments in, 359.
larvae in soil, dichloroethyl ether
for, U.S.D.A. 783.
survive low temperatures in South,
642.

diseases in Ozark section of Arkansas,
U.S.D.A. 769.grown in Minnesota, biochemical studies,
Minn. 437.grown under hillculture conditions, re-
sponse to modifications in cultural
treatment, 762.improvement and outstanding seedlings,
760.Italian Prune, leaf spot, Idaho 342, Utah
771.

magnesium deficiency in, 777.

pollen, longevity, 47.

respiration and maturity in, 762.

varieties, Ind. 185.

varieties in station tests, Miss. 52.

Plutella maculipennis, see Diamondback moth.*Poa compressa* seed germination, moistening
and drying as pretreatment in, 469.*Poa* spp., reproduction in, 467.*Poa* spp., seed germination at different alter-
nating temperatures, 16.*Podalonia* of North and Central America, 371.*Podocarpus* leaves, black fungus on, 637.

Poisonous plants, see Livestock poisoning.

Plants, poisonous, and specific plants.

*Poisons—

chemical, raticidal value, 669.

in grasshopper baits, tests, 362.

soil, duration of efficacy, 359.

Pollen—

honeybee-gathered, trapping and yields,
654.male gametes, small, functioning, effect
of female stock on, 456.

studies, U.S.D.A. 784.

tubes in angiosperms, morphology, 454.

tubes, methods for growing for physio-
logical and cytological studies, 454.

Polychrosis—

betraea—

action of sex scent in, 788.

intestine contents, pH and buffering
power, 788.*viteana*, see Grape berry moth.

Polyembryony, notes, 601.

Polygonatum generative cells, effect of col-
chicine on division, 310.*Polygonum utahense* n.sp., description, 447.Polyhalite as source of potassium for cotton,
Tex. 753.

Polymorphus—

marilis, new hosts and new locality, 535
n.sp., description, 535.*Polynema bifasciatipenne*, parasite of four-
spotted tree cricket, 505.*Polyphylla* spp., in Saratoga Forest Tree
Nursery, 651.

Polyploidy—

in cassava, shown by differences in size
of stomata, 310.induced by colchicine and technic of ap-
plication, 744.

relation to chemical analysis, 171.

Polyporaceae in northern Brazil, 100.

Polyporus—*citrinatus*, morphology, cultural charac-
ters, and histopathology, 854.*frondosus*, cause of oak heart rot, 488.

spp., notes, 351.

spp., of Rio Grande do Sul, Brazil, 100.

Polystictus—*sanguineus*, abnormal sterile form, 200
species and varieties in Rio Grande do
Sul, Brazil, 161.

Ponds, farm, fish production in, Ala. 73

Ponds for farm water supply, Iowa 678.

Opillia japonica, see Japanese beetle.

Poplar—

Hypoxylon canker of, 780.

ink-spot disease, 69.

yellow, germination and survival, effect
of seedbed treatment, Ga. 56.

Population—

analysis, [N.Y.] Cornell 834.

changes in and in percentages in differ-
ent age groups, R.I. 110.

growth, 1925, biology of, 288.

in Black River settlement, Louisiana,
situation and prospects, La. 266.

migration—

and social welfare, 119.

in and out of State, decrease in,
S.Dak. 834.

intercounty, in Colorado, Colo. 834.

rural, and adjustment, 691.

rural, in United States, 834.

rural urban, selective factors in,
[N.Y.] Cornell 834.

natural history of, 288.

of New Mexico, composition and changes,
N.Mex. 266.

rural, concepts of marginality in, 691.

trends in Colorado, Colo. 600.

Porcupine, damage to seed and seedlings on
cut-over Douglas fir lands, U.S.D.A. 641.*Poria weirii*, cause of Douglas fir root rot, 354.

Pork—

production, molasses v. grain rations for,
Utah 796.production on pasture, quality, S.Dak.
795.products, utilization and effect of freez-
ing storage, Ind. 268.quality, effect of hominy feed on, Ind.
227.

quality, factors affecting, U.S.D.A. 794.

Porosagrotis orthogonia, see Cutworm, pale
western.

Porphyria—

inherited as recessive character, 524.

porphyrin excretion in, 523.

Portheia dispar, see Gypsy moth.

Posthodiplostomum minimum, morphology and development of stages in life cycle of, 399.

Potash—

deficiency, diagnostic value of leaf symptoms, Miss. 60.

domestic v. foreign, for potatoes, U.S.D.A. 751.

studies, 582.

Potassium—

availability in soils, effects of wetting, drying, and treatments, 178.

content of orchard foliage, variations in, 50.

deficiency in carnation plants, symptoms, 211.

for cotton fertilizers, polyhalite as source, Tex. 753.

in plants, role of, 449.

isotopes in *Valonia* and *Nitella*, separation, 166.

lateral movement in orchard soil, 50.

leaching below 8-inch depth, effect of soil characteristics and winter legumes, 591.

leaching below feeding zone of plants, Ala. 13.

supply of fruit tree, effect of soil type [N.Y.]Cornell 761.

Potato(es)—

American, German, and wild varieties, in Cuba, 755.

and tobacco rotations, Pa. 464.

ascorbic acid in, effect of cooking and storage, 852.

bacterial ring rot—

in Rhode Island, U.S.D.A. 768.

new to Montana, identification and control, Mont. 630.

studies, 206, 326, 480, Colo. 630, Utah 771.

bacterial soft rot in southern Florida, Fla. 485.

bacterial wilt, studies, 64, 206.

blight, late—

breeding for resistance to, 485.

control by resistant strains, 60.

in 1940, U.S.D.A. 629.

in Minnesota, U.S.D.A. 768.

notes, U.S.D.A. 59.

resistance of varieties and seedling progenies to, 64.

situation in Virginia in 1940, U.S.D.A. 630.

blights, early and late, spray tests for, Tex. 770.

bluestem, insect transmission, W.Va. 771.

bordeaux formulas for, N.J. 769.

bought on a retail market, palatability and color, 270.

breeding, Colo. 612, [N.Y.]Cornell 751, Pa. 464, U.S.D.A. 751.

breeding, in South, technic and methods, 178.

composition and culinary quality, factors affecting, [N.Y.]Cornell 752.

cooked, texture, relation to pectin, 839.

cooking quality, Colo. 692.

Potato(es)—Continued.

cooking quality, effect of fertilizers, N.H. 614.

cooperative marketing by Ohio Farm Bureau Cooperative Association, 264.

cull, uses of products from, Idaho 293.

culture in South, results of research work on, 178.

degeneration due to heat, Pa. 464.

digger adjustment, relation to tuber bruising, 467.

digger, improved tractor, [N.Y.]Cornell 826.

discs, balance sheet of metabolites showing effect of salts and dissolved oxygen on metabolism, 167.

disease causing gangrene, 630.

disease control by rotation, [N.Y.]Cornell 769.

disease of Ohio, handbook, Ohio 348.

disease, on Maryland Eastern Shore, control, Md. 348.

diseases, soil-borne, Utah 771.

diseases, virus, in 1939, 64.

domestic v. foreign potash for, U.S.D.A. 751.

early-crop, short-fertilized rotations for, W.Va. 754.

effect of boron, Mont. 617.

experiment with, N.H. 826.

fall, culture experiments, Okla. 752.

fertilization research in South, 178.

fertilizer and nutrition studies, 327.

fertilizer experiments, Conn.[New Haven] 464, Idaho 319, Mont. 612, N.J. 751, [N.Y.]Cornell 752, Okla. 752, R.I. 34, Tex. 753, W.Va. 754.

field experiments with, importance of border effect in, 39.

fla beetle injuries, relative prevalence in fields adjoining uncultivated areas, 504.

fla beetle, resistance of wild potatoes to, 216.

genetics, cytogenetics, and breeding, 605.

green manure and harvesting tests, Ga. 34.

Green Mountain, nitrogen needs, N.J. 751.

growing and research in Central Europe, 826.

grown in muck and other soil types, color and composition, relation to culinary quality, Ind. 268.

grown in muck soils, efficiency of spraying and dusting practices, [N.Y.]Cornell 786.

growth, yield, and seed value, ecological factors affecting, [N.Y.]Cornell 752.

Improvement Association, Nebraska, report, 326.

improvement, value of colchicine in, N.J. 751.

infected with California aster yellows, 485.

injury and wireworms, [N.Y.]Cornell 786.

insect surveys, 216.

insects of Iowa, control, Iowa 789.

insects on Long Island [N.Y.]Cornell 786.

Potato(es)—Continued.

- insects, studies, Ind. 212.
- irrigation experiments, [N.Y.]Cornell 752, Tex. 753.
- Kaw Valley, marketing problems, 541.
- leaf roll, loss in yield caused by, determination, 627.
- leafhopper—
 - on beans, Tex. 787, U.S.D.A. 500.
 - on rose, 78.
 - population and hopperburn development, effect of planting date, 500.
 - resistance of wild potatoes to, 218.
- leaves, alcoholic extract, mineral composition, relation to crop yields, 308.
- locally grown and Maine No. 1 Green Mountain, relative prices, R.I. 110.
- loss in yield caused by diseased or missing plants, determination, 627.
- market, defects in, Pa. 464.
- marketing and decline of industry in Kansas, 541.
- mineral deficiencies in, injection for diagnosis of, 449.
- minor element spray test, Tex. 753.
- net necrosis in western Washington, 58.
- New Jersey, markets for, N.J. 751.
- Ohio, marketability, factors of grade affecting, 110.
- pft scab, role of insects in, 628, 789.
- planting and pH range tests, R.I. 34.
- pollen, studies, 169.
- psyllid resistance in, Colo. 642.
- psyllid, studies, Mont. 786, Tex. 787.
- psyllid yellows, U.S.D.A. 59.
- purple-top wilt in Pennsylvania, 627.
- recent root knot damage in, 489.
- refinements in field plot technic in relation to, 173.
- resistance to viruses A and X, components of mild mosaic, 349.
- respiration rate at high temperatures, relation to treatment with ethylene chlorhydrin, 40.
- response to different sources of nitrogen, phosphorus, and potash, 327.
- ring rot, detection, fluorescence under ultraviolet light for, 628.
- ring rot, studies, 628, U.S.D.A. 59, 342, 768.
- rotation experiments, 182, [N.Y.]Cornell 752, 786.
- Russet Burbank, effect of fertilizer treatments on culinary characteristics, Colo. 693.
- scab control, Tex. 770.
- scab, long-time project, Vt. 200.
- scab resistance, seedling tests for, [N.Y.]Cornell 769.
- seed, aspects of southern tests, 178.
- seed, certified, fertilizer studies, U.S.D.A. 751.
- seed, certified lots, yield differences in, Ala. 33.
- seed, certified, vital methods for producing under irrigation, 326.
- seed treatment, studies, 350, Idaho 342, N.Y.State 205.

Potato(es)—Continued.

- seedlings, reactions to viruses, Idaho 342.
 - sloughing, relation to calcium ion, 414.
 - sold in retail stores offering choices, amount and grade, [N.Y.]Cornell 827.
 - sprain disease, first appearance in the State, R.I. 60.
 - spraying experiments, R.I. 60.
 - sprays, timing, Pa. 464.
 - stand of plants in fall crop, relation to seed preparation and cultural treatments, 40.
 - steamed, feeding experiment with laying ducks, 233.
 - steamed, for laying pullets, 232.
 - steamed, in table poultry rations, 233.
 - storage in boxes v. in bulk, Idaho 319.
 - tuber worm, as tomato pest, Calif. 792.
 - tubers, lightning injury to, 634.
 - tubers, rooting at cut surface, effect of stage of rest period, 17.
 - tubers, shape and development, significance in diagnosis of spindle tuber, 775.
 - varieties, deep-fat frying tests with, Colo. 693.
 - varieties recently distributed to growers in United States, 181.
 - varieties, response to soil reactions and planting dates, Pa. 464.
 - variety tests, Ga. 33, N.J. 751, Okla. 752, R.I. 34, Tex. 752, Utah 753.
 - viruses, movement, 627.
 - water-soluble fraction in, Idaho 412.
 - yellow dwarf—
 - and tobacco streak, comparison of viruses, 681.
 - notes, [N.Y.]Cornell 769.
 - virus, ability of clover leafhopper to transmit, variation in, 627.
 - virus, partial purification, 627.
 - virus, strains of, 349.
 - yield, starch, and mineral content, Colo. 612.
 - yield tests, two-dimensional quasi-factorial design v. randomized block design, 326.
- Poultry—see also Chicken(s), Chick(s), Cockerels, Duck(s), Fowl(s), Hens, etc.
- body conformation, heritable differences in Okla. 748.
 - breeding for egg weight and related characters, 173.
 - breeding small flocks for high fecundity, 457.
 - breeding, treatise, 511.
 - Brown Leghorn, developmental anatomy of breast feather, and its reaction to oestrone, 607.
 - carotene and vitamin A requirements, Idaho 372.
 - castrated Brown Leghorn, problem of molt in, 608.
 - composition of bones from left and right sides, W.Va. 796.
 - crossbred, value for meat production, Okla. 748.

Poultry—Continued.

- disease(s)—*see also specific diseases*.
and mortality, genetic resistance to,
[N.Y.]Cornell 747.
apparently identical with nutri-
tional encephalomalacia, 821.
bacterial, check list, 676.
importance of pathological study in,
532, 821.
in Southern States, 108.
laboratory diagnosis, Ind. 248.
pathology research, inheritance as
factor in, 389.
prevention, 251, 389.
relation to ascorbic acid in blood,
513.
droppings, character, effect of feed in-
gredients, 510.
effect of feeding wheat germ oil, 512.
efficiency of progeny tests, effect of con-
trolled culling, 93.
farming, commercial, in Florida, 115.
farms of Connecticut, factors determin-
ing earnings, 511.
farms, profits on, 405.
feed mixer and grinder, Idaho 399.
feeding, U.S.D.A. 794.
feeding, saving and drying kitchen waste
for in Great Britain, 793.
feeds, metabolizable energy, Tex. 231.
flocks, viability in, 532, 802.
frozen storage, surface drying and per-
oxide oxygen formation, 661.
genetic studies in, 607.
gizzard ulceration, 532.
helminths, efficiency of phenothiazine
against, 817.
houses, hard-surfaced floors for, S.Dak.
823.
houses, temperature, effect of differing
roofing materials, N.J. 794.
houses, value, 226.
houses, ventilation, Ind. 254.
improved, in the South, hatcheryman as
key, 226.
improvement plan, national status,
U.S.D.A. 747.
improvement project of Alabama, 226.
individual matings where separate breed-
ing pens are not available, N.J. 794.
iodine requirements, Colo. 655.
judging, training for, Miss. 545.
Legbar, down color of progeny of light
and dark parents, 607.
Leghorn, selected for freedom from
paralysis, laying house mortality, N.J.
794.
legume silage for, formulas, Tenn. 361.
lice eradication, derris infusion as dip
for, 500.
management, treatise, 231.
mortality, reducing by selective breed-
ing, Idaho 372.
neoplastic conditions in, Ind. 243.
nutrition, role of manganese in and re-
lation to perosis, [N.Y.]Cornell 802.
nutritional deficiency diseases, 388.

Poultry—Continued.

- parasites, control, practitioner's role in,
389.
parasites, treatment for removal,
U.S.D.A. 813.
problems of Southern States, 226.
protein supplements for, gross value,
Wash. 381.
rations, fat requirement, N.J. 794.
rations, use of distillers byproducts in,
511.
rations, use of white grain in, Idaho 372.
research in North Central States, 510.
research laboratory, regional, proposed
breeding program, 511.
riboflavin requirements, Pa. 507.
Science Association, meeting, papers, 509.
seasonal metabolic rhythms in, 94.
selecting breeders among, measurement
tables as guide, Okla. 748.
strains different in size and egg weights,
Ind. 173.
strains differing in egg production
[N.Y.]Cornell 747.
summer green feeds for, 226.
utilization of minerals from various
sources, Colo. 655.
vitamin D for, S-4 Type sun lamps v.
cod-liver oil as source, Ohio 804.
vitamin G complex requirements,
[N.Y.]Cornell 802.
White Leghorn breeders, selection for long
life in progeny, W.Va. 748.
Power machinery for farm, [N.Y.]Cornell 826.
Prairie—
areas, relic, in central Wisconsin, 594.
chicken, greater, parasites of, in Illinois,
641.
mixed-grass, of Oklahoma, effect of over-
grazing and erosion, 447.
plants, water content and osmotic pres-
sure, relation to environment, 600.
section of Texas, Blackland, response to
fertilizers, 611.
Pratylenchus pratensis, distribution and re-
lation to *Fusarium* wilt of cotton, U.S.D.A.
489.
Precipitation—*see also* Rainfall, Snow, etc.
conservation by summer fallowed soil
tanks in Saskatchewan, 11.
effect of altitude, Idaho 399.
tree rings as record, in western Nebraska,
296.
Pregnancy—
and lactation, diet during, 695.
delayed, in albino rat, experimental
shortening, 318.
disease, Tex. 813.
in rats, effect of heterologous anti-
gonadotropic sera on course of, 176.
maintenance in castrated rats by pro-
gesterone, 318.
nutritional balance in, 842.
urine, human, new oestrogenic substance
in, 611.
vitamin C in blood during and after, 136.

- Pregnant mare serum, effect on blood and liver lipids of fowls, 32.
- Pregnenolone, effectiveness in inducing copulatory response in spayed guinea pigs after oestrogen conditioning, 460.
- Preserves, sugar tests on, 841.
- Price(s)—
analyses, wars, and depressions, 681.
control, Government, advantages and disadvantages, 262.
control, war-time, in United Kingdom, 681.
fixing by foreign governments, bibliography, U.S.D.A. 262.
received by North Carolina farmers, N.C. 544.
variations among retail grocery stores of Burlington, Vt. 429.
- Pricklypear, *see* Cactus.
- Primulas, effect of magnesium, 779.
- Printing, public ownership v. State purchasing, 141.
- Prodenia eridania*, *see* Armyworm, southern.
- Prodenia praefica* as tomato pest, Calif. 792.
- Progesterone—
activity in spayed females not pretreated with oestrin, 460.
administration, inducing relaxation of pelvic ligaments in guinea pigs, 173.
and amniotin combinations, effect on uterine weight of rats and mice, 750.
androgenicity of, 460.
assay method, 175, 611.
effectiveness in inducing copulatory response in spayed guinea pigs after oestrogen conditioning, 460.
restoration of ovulatory cycles and corpus luteum formation by, 460.
synthetic, effect on young male rats, 610.
- Program planning and building, standards of value for, U.S.D.A. 118.
- Prolactin—
assay, modification of Riddle's method, 463.
micro-assay, effect of volume used for injection in, 319.
- Prontosils, progress in use in animal diseases, 243.
- Propionic acid, synthesis, from CO₂ radioactive carbon as tracer in, 603.
- Prostate gland in female rat, embryology and postnatal development, 611.
- Protein(s)—
concentrates, animal and vegetable, in chick rations, comparison, 511.
conversion of inorganic nitrogen to, in vitro, 663, Wis. 662.
dynamic effects, Pa. 507.
effect of ultraviolet light on, N.Y.State 582.
hydroxyamino acids in, U.S.D.A. 662.
importance of quality in feeds, 227.
levels for pigs, Pa. 508.
metabolism during prolonged fasting in dogs, 124.
of grains and seeds, effects of storage, U.S.D.A. 725.
- Protein(s)—Continued.
relative value, for chickens, determining, 511.
requirement in adolescence and in middle age, 606.
requirements for milk production, 517.
structure and denaturation, N.Y.State 582.
studios, 510.
- Prothrombin—
changes in banked blood, 715.
concentration in man, effect of synthetic vitamin K compounds, 852.
deficiency production and response to vitamins A, D, and K, 715.
deficiency, treatment with 2-methyl-1, 4-naphthoquinone, 715.
in blood of newborn infants, 569.
levels and synthetic vitamin K in obstructive jaundice of rats, 568.
- Protococcus* sp., pigments produced in darkness by, 743.
- Protoconospora phoradendri* n.sp. on mistletoe, 355.
- Protoparce quinquemaculata*, *see* Tobacco worm.
- Protoparce scota*, *see* Tomato worm.
- Protoplasm, sieve-tube, supposed permeability of, 16.
- Protoplasmic streaming—
control, 599.
in oat coleoptile, factors affecting, 162.
theoretical and experimental studies, 593.
- Prune(s)—
French, drying ratios, effect of yields, 52.
leaf spot of Italian variety, 779.
nutritive value, 269.
orchards, control of pear thrips in, 642.
varieties, Ind. 185.
- Pruning—*see also specific crops*.
modified leader v. open-center types, Okla. 757.
new method, 479.
- Prunus cerasus*, virus disease, 628.
- Prunus* species used as stocks, relative cold resistance, 102.
- Psallus seriatus*, *see* Cotton flea hopper.
- Pseudococcus*—
adonidum, *see* Mealybug, long-tailed.
brevipies, *see* Mealybug, pineapple.
citri, *see* Mealybug, citrus.
comstocki, *see* Mealybug, Comstock's.
nipae, *see* Mealybug, coconut.
- Pseudognathopus magnus* n.sp., description, 224.
- Pseudomonas*—
aeruginosa group, action against disease-producing bacteria, 525.
citri, *see* Citrus canker.
fluorescens, notes, Pa. 480.
nigritiacens, suggested name for causal organism of butter bacterial discoloration, 811.
radicola, *see* Nodule bacteria.
- Pseudoperonospora humuli*, host range, 775.
- Pseudophyous utilis*, establishment, P.R. 640.

- Psittacosis**—
in importations of psittacine birds, 393
possible response to sulfapyridine, 525.
- Psocid**, seed-infesting, new to North America, 642.
- Psychology**, comparative, plants and invertebrates, 492.
- Psylla pyricola**, see Pear psylla.
- Psyllid(s)**—
in 1938 and outlook for 1939, 326.
resistance in potatoes, Colo. 642.
- Pterochlorus persioae**, life history, 217.
- Ptinidae** in dwellings and warehouses of Canada, key to species, 223.
- Puccinia**—
British species, included under *P. syn-gonestarum*, 632.
graminis, flexuous hyphae, 627.
graminis in laboratory, longevity of teliospores, 773.
graminis tritici—see also Wheat stem rust.
in Argentina, Chile, and Uruguay, physiologic specialization, 632.
helianthi, aberrant strain, 343.
peridermiospora on ash trees, U.S.D.A. 199.
suaveolens, urediospores as origin of systemic mycelia in, 627.
- Pucciniastrum erioae** in America, hosts for, U.S.D.A. 199.
- Puerto Rico Station, report, 575, 718.
- Pulex irritans**, see Flea, human.
- Pullet(s)**—see also Fowl(s) and Poultry.
disease or blue comb, pathology, 389.
disease, pathologic concept, 532.
egg-producing ability, relation to growth rate, N.J. 794.
laying, palm-kernel and peanut meals in rations for, 381.
laying, steamed potatoes for, 232.
summer management, Ohio 94.
- Pullorum disease**—see also *Salmonella pullorum*.
agglutination test for, Ind. 243.
and paratyphoid infections in poultry, Colo. 668.
control and eradication, outlook, 532.
eradication in Massachusetts, Mass. 107
in poultry flocks, control and eradication, Idaho 389.
in turkeys, 535.
in two poultry breeds, 389.
testing with whole blood, causes for false reactions, 398.
- Pulpwood** on farm woodlands of Upper Connecticut Valley, cost of production, U.S.D.A. 199.
- Pumpkins**, canning quality, factors affecting, Ind. 150.
- Purdue University, notes, 432.
- Pyonopseia**, systematic study, 311.
- Pyometra**, bovine, *Corynebacterium equi* in, 527.
- Pyralis farinalis**, see Meal moth.
- Pyrausta nubilalis**, see Corn borer, European.
- Pyrenomyces** recorded for Britain, list, 593.
- Pyrenopeziza**, new species, 23.
- Pyrethrum**—
deterioration, 496.
emulsion and paris green as anopheline larvicides in Georgia, 220.
insect sprays, prolonging toxicity, 496.
oil spray for reduction of beet leafhopper on tomatoes, Idaho 357.
- Pyrgotidae** species, parasitic on Japanese beetles, U.S.D.A. 503.
- Pyridine**, concentration-mortality curves for solutions toxic to eggs of *Lygaeus kalmii*, 360.
- Pyridoxin**, see Vitamin B₆.
- Pyrrilla perpusilla**, bionomics and control, 363.
- Pyruvate** injected in rabbit, fate of, 135.
- Pyruvic acid**—
in barley respiration, formation, 451.
metabolism in normal and vitamin B₆-deficient states, 133.
- Pythiomorpha gonapodioides**, synthesis of thiamin and biotin by, 305.
- Pythium**—
aphanidermatum, notes, 60.
foot rot of small grains in Virginia, U.S.D.A. 769.
root and bulb rots of tulip, 200.
spp., from soil, quick method of isolating, 481.
spp. on wheat, control, 347.
- Quail**—
bobwhite—
effect of management, Okla. 781.
food and cover plants in Brazos County, Texas, phenology, 492.
genetic experiments with, Tex. 782.
parasites of, in Illinois, 641.
populations, effect of woodland management, Tex. 355.
cannibalism among, salt as curative, 355.
eggs, incubation, effect of temperature, humidity, and air movement, 516.
food and enemies, Okla. 781.
food and shelter for, effect of cover control, Tex. 781.
habits, food, enemies, diseases, etc., in Southeastern States, 783.
management and winter food, Tex. 781.
nutrition and feeding, U.S.D.A. 794.
production on Lake Carl Blackwell game farm, Okla. 781.
- Quinoline**, concentration-mortality curves for solutions toxic to eggs of *Lygaeus kalmii*, 360.
- Quinones**, antihemorrhagic, comparative activities, 506.
- Rabbit(s)**—
and steers, relative ability to digest pasture herbage, 223.
appearance of hair and hair growth on shaved areas, effect of maturity, sex, and oestrinization, 317.
artificially infected with avian tubercle bacilli, effect of sulfapyridine, 244.
cestode parasites of, 73.
cottontail and Jack, susceptibility to equine encephalomyelitis, 249.
cottontail, worst enemies, Pa. 495.

Rabbit(s)—Continued.

- damage to seed and seedlings on cut-over Douglas fir lands, U.S.D.A. 641.
- dwarf mutation in, 314.
- feeding for meat and fur, 509.
- food and parasites in lowland area of Oklahoma, 491.
- hematology of avitaminosis A in, 508.
- nematode parasites of, 72.
- nutrition and lactation studies, U.S.D.A. 662.
- on vitamin B-deficient diet, intestinal yeast flora of, 228.
- papilloma virus, purification and properties, 388.
- Soviet, Marder variety, 606.
- superovulation in, 174.

Rabies—

- canine, vaccination with phenol-treated vaccine, 250.
- control and prevention, 398.
- vaccination, efficacy of single intraperitoneal injection method with phenol-treated vaccine, 388.
- vaccines, potency of, 388.

Raccoon—

- food habits, in eastern Iowa, 492.
- parasites of, in Illinois, 641.
- severe parasitism in, 783.

Radiosonde, improved, and its performance, 152.

Rattus tetrax, efficiency of phenothiazine against, 252, 317.

Rainfall—see also Precipitation.

- and run-off from watersheds—
- and terraces of Fort Hays Conservation Experiment Station, 442.
- of Missouri Valley, compilation, U.S.D.A. 442.
- of Texas Experiment Station, U.S.D.A. 154.
- and water planning in Minnesota, 442.
- effects on erosion-measurement plots, Miss. 300.
- frequency determinations, accuracy, 441.
- great, 11.

Raisin moth, role in spoilage of mature vine grapes, U.S.D.A. 783.

Raisins, stored, protection against crawling insects, U.S.D.A. 783.

Ramie fibers, chemical identification, 717.

Ranch—

- lands, tax-price ratio, 1913 to 1938, trends, Tex. 828.
- stability, effect of cultural practices, seeding methods, and livestock husbandry, Nev. 484.

Range(s)—

- and pasture botany, studies in, 159.
- and pasture utilization, U.S.D.A. 794.
- depleted, revegetation, Colo. 612.
- forage composition, effect of stage of maturity, Idaho 372.
- grasses, see Grass(es).
- improvement through conservation of flood waters, Mont. 254.
- land conservation, economic aspects, 114.

Range(s)—Continued.

- lands, effect of too early and too heavy grazing, Utah 613.
- midwestern, deterioration, 180.
- native, natural revegetation of, Colo. 612.
- new and extended, for Utah plants, 446.
- outlook, new, U.S.D.A. 687.
- overgrazed, management as cure for, 823.
- plants and their root reserves, effect of grazing methods, Utah 754.
- plants, common, of Arizona and New Mexico, 24.
- plants, fall and winter, phosphorus content, Idaho 372.
- plants, nutritional value, Ariz. 89.
- plants, poisonous, see Plant(s), poisonous.
- plants, Livestock poisoning, and specific plants.
- plants, summer, phosphorus in, Utah 754.
- plants, water requirements and fertilizer tests of, Ariz. 33.
- resource surveys, Colo. 612.
- revegetation, Utah 754.
- vegetation, composition and utilization, Tex. 89.
- Ranunculus* occurring in North America, monographing, Ariz. 17.
- Raphidia ophiopsis*, effect of *Empusa webbi* on larvae, 788.
- Raspberry (ies)—
- anthracnose control, 629.
- ascorbic acid in, comparison with crystalline form, utilization by college women, 425.
- autumn-fruiting, breeding, 198.
- black, new disease in Pennsylvania, U.S.D.A. 769.
- crown gall, control, 486.
- culture and disease control, Ill. 53.
- diseases, N.Y.State 630.
- fruitworm, U.S.D.A. 784.
- growth and production, effect of mulching, 192.
- inbreeding experiments, Conn.[New Haven] 47.
- inheritance and linkage in, 456.
- leaf area and weight and leaf weight and fruit production, correlations between, 762.
- methods of protection and fertilization to reduce winter damage, Colo. 324.
- mosaic control, 66.
- mulching, N.J. 761, W.Va. 758.
- new, introduction, U.S.D.A. 756.
- new variety, Tennessee Autumn, description, Tenn. 198.
- production, prices, returns, etc., N.H. 685.
- roots, phycomycete affecting 59.
- selective fertilization 456.
- spur blight, control, 66, N.J. 769.
- streak disease, mild, in Maryland, U.S.D.A. 59.
- trailing, characteristics and breeding, N.C. 621.
- varieties, W.Va. 758.
- winter injury to, Colo. 617.
- yield, hardiness, and fruiting period, variety comparisons, 763.

Rat(s)—*see also* **Rodent(s)**.

- change of age of puberty by selective mating, 178.
- fed galactose, effect of exercise on growth and cataract development, 417.
- fed white flour, hyperplasia in forestomach epithelium, prevention, 705.
- female, a technic suppressing development of reproductive function and sensitivity to oestrogen in, 749.
- female, growth, effect of reproductive condition, 31.
- female, postnatal masculinization with testosterone propionate, 31.
- female, treated with testosterone propionate, masculinization, 749.
- filtrate factor, multiple nature of, 700.
- flea, oriental, distribution and hosts, 74.
- male and female, differences in vitamin E requirements, Idaho 372.
- male, reproductive organs in, effect of oestrogen and androgen injections, 174.
- mite, tropical, in Minnesota, 506.
- of low fertility and high incidence of mammary tumors, abnormal growth in, 606.
- on deficiency diet, change in body weight and food consumption, 842.
- on vitamin B-deficient diet, intestinal yeast flora of, 228.
- on vitamin E-deficient diet, sterility and depression of growth in relation to age, 798.
- prolongation of productive life, [N.Y.] Cornell 795.
- reproduction in, on diets of purified food, Conn.[New Haven] 547.
- reproductive efficiency under different breeding conditions, 31.
- respiration apparatus for serial work with, 782.
- virus inquiry report, 669.
- vitamin A in, histological demonstration, 558.
- white-throated wood, life history and ecology, relation to grazing, Ariz. 72.

Rayon(s)—

- chemical identification, 717.
- recent developments in, 571.

Real estate—

- instruments recorded in Payne County, 1895-1939, for properties in or near mineral areas, Okla. 827.
- mortgaged, deficiency judgment problem resulting from foreclosure, 112.
- rural and urban, equitable assessment of, Tex. 828.

Red berry mite, U.S.D.A. 784.**Red mite**—

- citrus, distribution and food plant records of, U.S.D.A. 785.
- European, control, Conn.[New Haven] 495, N.Y.State 642.
- European, distribution and food plant records of, U.S.D.A. 785.

Red scale—

- California, control with hydrocyanic acid gas, 647.

Red scale—Continued.

- Florida, effect of temperature, U.S.D.A. 788.
- fumigation with cyanide and toxicants in oil, U.S.D.A. 788.
- two strains, 791.

Red spider—

- control, N.Y.State 642, Tex. 787.
- control with adhesives, 788.
- notes, N.J. 786, Pa. 495, U.S.D.A. 784.
- on hops, control, 88.
- on roses, control, 194.
- on strawberries, control, La. 357.
- on water hyacinth, entomogenous fungus on, 212.
- toxicity of selenium-containing plants for control, 798.

Redbud canker in New Jersey, U.S.D.A. 769.**Redbud insects**, 75.**Redwoods**—

- coast, climatic chronology in, 296.
- of California coast, problems in dating rings, 296.

Reed canary grass, hull-less seeds, germination, 470.**Reforestation**, role of soil organic matter in, 479.**Refrigeration in farm household**, Ind. 286.**Refrigerator**—

- cars, icing, for transporting citrus fruits, U.S.D.A. 756.
- home-made walk-in type, Ark. 677.

Relapsing fever and ticks in United States, 794.**Relationships**, analyzing data for, [N.Y.] Cornell 287.**Bennet test**, viscosimetric form of, 295.**Rennin in whey**, inactivation, effect of heat and pH, 100.**Renolds n.app.**, descriptions, 652.**Reproduction**—

- in rats on synthetic B-complex supplement, 848.
- physiology of, numerous phases, U.S.D.A. 662.

Resazurin test—

- comparator for, 730.
- for milk, compared with other tests, 288.

Rescue grass smut, different methods of combating, 203.**Research**—*see also* **Agricultural research**.

work, improved and expanded facilities for, Miss. 430.

Respiration—

- and catalase, relation between, 16.
- and oxygen requirements of *Nuphar advenum* and other water plants, 16.
- apparatus for serial work with small animals, 782.
- in horticultural plants, environment-control chamber for study, 164.
- in wheat grain, relation to freezable water, 599.
- micro-, differential volumeter for measurements, 16.
- plant, mechanism of, 25.
- protoplasmic streaming, and auxin transport in *Avena* coleoptile, relation, 162.

Respiration—Continued.

- rate in relation to nitrogen metabolism of potato tuber, 17.
- Respirometers, Warburg, in plant physiology, 602.
- Rhabdophaga*, separation of species, 225.
- Rhabdospora* parasitizing bindweed, Idaho 342.
- Rhabdospora* sp., notes, 69.
- Rhagoletia cingulata*, see Cherry maggot.
- Rhagoletia pomonella*, see Apple maggot and Blueberry maggot.
- Rhaphium rossi* n.sp., description, 221.
- Rhinoceros beetle, coconut, protective seed treatments, etc., against, P.R. 640.
- Rhinotrichum depauperatum* n.sp. on spider mites on water hyacinth, 212.
- Rhipicephalus sanguineus*, see Dog tick, brown.
- Rhizobium*—
- growth metabolism, 21.
 - leguminosarum* cultures for inoculation of peas, 187.
 - meliloti*, nitrogen-fixation efficiency, effect of host plant, 35.
 - meliloti*, resting cells, respiration studies, 169.
 - meliloti* strains, nitrogen fixation on legumes, 598.
 - respiration rates, estimation and significance, 168.
 - sp. on soybeans, nodulation and nitrogen fixation, 448.
 - spp., inoculation of peanut plants with, response, 447.
 - strains, ineffective, structure of and effect on nitrogen fixation, 168.
 - strains, inefficiency of, suggested explanation, 168.
 - trifolii*, biotin as growth stimulant, 742
- Rhizoctonia*—
- defoliation of holly cuttings by, 627.
 - solani* from potato and sugar beet, pathogenicity studies, 634.
 - solani* on cotton seedlings, 774.
 - spp. on potatoes in Argentina, 206.
- Rhizopus stinus*, synthesis of biotin and thiamin by, 304.
- Rhode Island Station, report, 141.
- Rhodes grass, root reserves in, storage, 308.
- Rhododendron(s)—
- detrimental effect of walnut to, 211.
 - effect of winter droughts, N.J. 765.
 - midge, studies, 216.
 - propagation, [N.Y.]Cornell 765.
 - shoot growth and flower-bud set in, 196, [N.Y.]Cornell 765.
- Rhopalosiphum pseudobrassicæ*, see Turnip aphid.
- Rhubarb—
- improvement, Pa. 471.
 - leaf, amide synthesis in, Conn.[New Haven] 487.
 - variety tests, Ga. 44.
- Rhus* and allied genera, wood anatomy and pollen morphology, 24.
- Rhyacionia buoliana*, see Pine shoot moth, European.

Riboflavin—

- and vitamin B₁ in economy of food utilization, Ark. 793.
 - and vitamin B₁ of milk, 519.
 - assay, depletion of birds for, Colo. 655.
 - deficiency, relation to ocular lesions, 707.
 - dietary, level, effect on quantity stored in eggs and rates of storage, 514.
 - effect on chick growth and curled-toe paralysis, 510, 514.
 - estimation, new biological method, 583.
 - growth response of plants to, 20.
 - in distillers' residues, 507.
 - in eggs and tissues, effect of rations of hen, 510.
 - in hays and grasses at different stages of maturity, 227.
 - in liver, biological assay, 584.
 - in liver extract, 293.
 - in quick-frozen food, 694.
 - in rumen content of cattle, 790.
 - in urine and tissues of dogs and rats, bacterial assay, 564.
 - in vegetables and fruits, 422.
 - in vegetables, effect of quick-freezing and canning, 561.
 - in yeasts, 151.
 - minimum requirement for growing pigs, 377.
 - production of staphylococci, [N.Y.]Cornell 806.
 - properties, food sources, and stability, 847.
 - requirements of White Leghorn and Barred Plymouth Rock chickens, Pa. 507.
 - stability in irradiated milk, Wis. 664.
 - studies, 582.
 - synthesis in feces of fowl, 514.
- Rice—
- arsenic compounds toxic to, 182.
 - black kernels, effect of fertilizers and seed treatments, Tex. 770.
 - breeding, Tex. 752, U.S.D.A. 751.
 - cadang-cadang, probable cause, 60.
 - carriers of nitrogen and phosphorus for, Tex. 753.
 - Cercospora oryzae* in, inheritance of resistance to, 605.
 - culture experiments, Tex. 753.
 - diseases and physiology, Tex. 770.
 - diseases, control, Ark. 680.
 - fertilizer experiments, Tex. 753.
 - high-quality, varieties, U.S.D.A. 751.
 - insect pests in Guam, 358.
 - irrigation, sources of water to supplement declining well supply, Ark. 677.
 - linkage of two resistant factors to *Cercospora oryzae*, 629.
 - new outstanding strains, Ark. 612.
 - palay lalake, a fungus disease, 60.
 - parboiled, v. unmilled raw, antineuritic value, 278.
 - polished, growth factor in, and requirement by chicks, 513.
 - proteins, nutritive value, effect of amino acid additions on growth, 550.

Rice—Continued.

- rough, farm storage and marketing in Arkansas, Ark. 118.
- Sclerotium* diseases, causal fungi, physiological studies, 346.
- straw, new species of *Plettillaria* on, 311.
- strawstacks, fungi recovered from dust of, Tex. 770.
- tillering and flowering in, 632.
- tolerance to different soil reactions, Tex 753.
- variety tests, Ark. 40, Tex 752.
- wild, ergot in Maine, U.S.D.A. 199.
- yield, milling quality, and other characters in, effect of time of seeding, 614.

Rickets—

- experimental, in rats, behavior and fate of cartilage remnants in rachitic metaphysis, 138.
- healing, histology of bone growth in, W.Va. 842.
- healing without aid of vitamin D, Conn [New Haven] 547.
- in calves, prevention, Okla. 806.
- production, comparison of cereal and non-cereal diets in, 138.
- treatment, with one massive dose of vitamin D, 567.

Rickettsia diaporica, persistence in tissues of *Ornithodoros turicata*, 393.

Rickettsias, of typhus-Rocky-Mountain-spotted-fever group in South Africa, 523.

Rickettsiosis of sheep new to South Africa, 523.

Ringworm fungus, squirrel as new host to, 525.

River-bottoms and houseboat people, 544.

River measurement, see Stream flow.

Roasters, electric, studies, Va. 286.

Rodent(s)—see also Mice and Rat(s).

- control, 73, 629, Ind. 212, Kans. 333.
- pests in New York, economics and biology, [N.Y.] Cornell 781.
- seasonal utilization and forage requirements of range vegetation by, Ariz. 73.

wild, epizootics of plague infection in western United States, 392.

Roentgen rays, see X-ray.

Root(s)—

- aerobic respiration, interaction, and electrochemical behavior of surface of protoplasm, 595.
- cells, salt accumulation by, methods for recovery of tissue fluids, 307.
- cuttings, regeneration, role of growth substances in, 453.
- extension, estimation of volume of water made available by, 744.
- growth, oxygen tension in relation to, N.J. 735.
- inducing activity of individual substances and mixtures, comparison, 17.
- isolated, growth factor requirements, 597.
- knot, breeding for resistance to, inducing uniform soil infestations of nematodes as aid, U.S.D.A. 489.

Root(s)—Continued.

- knot in Florida cigar-wrapper tobacco fields, control, U.S.D.A. 489.
 - knot injury to peach trees and other plants, U.S.D.A. 199.
 - knot nematode(s)—
 - and cotton wilt, 63.
 - attacking stems and leaves of plants, U.S.D.A. 489.
 - control, chemical treatment of soil for, U.S.D.A. 490.
 - control in greenhouse tomatoes, R.I. 60.
 - diseases in Virginia, U.S.D.A. 489.
 - effect of crop rotation on, U.S.D.A. 489.
 - in potatoes, control by irrigation, U.S.D.A. 489.
 - infestation, plants resistant or tolerant to, U.S.D.A. 490.
 - list of hosts, additions to, U.S.D.A. 489.
 - spread by man, U.S.D.A. 768.
 - nematode of tomatoes, Ind. 212.
 - nodules, see Nodule bacteria.
 - penetration, effect of compact subsoil horizon on, 479.
 - pressure, effectiveness in ascent of sap, 450.
 - studies, container for growing plants for, 454.
 - worms, protection of strawberries from, 359.
- Rootstocks, clonal, propagation and introduction, N.Y. State 618.
- Rosa multiflora* and its progeny, 338.
- Rose(s)—
- beetle, Fuller's, control, 781.
 - Better Times, effect of incorporating sand with soil, Pa. 471.
 - black mold of grafts, causing death of scions, 353.
 - black spot, relative susceptibility of varieties to, U.S.D.A. 630.
 - black spot, studies, Tex. 770.
 - blooms, fading, factors in, 477.
 - breeding, 338.
 - bushes, sprayed with nicotine sulfate combinations, persistence of nicotine on, 361.
 - calcium and phosphorus nutrition, N.J. 765.
 - cultural requirements, [N.Y.] Cornell 765.
 - culture in cinder and gravel for greenhouse flowering, 194.
 - culture in home garden, Tex. 196.
 - different understocks for, value, 338.
 - diseases, notes, [N.Y.] Cornell 769.
 - diseases, relation to fertilizers, 779.
 - effect of native peats in culture, Pa. 471.
 - growth in alkaline soil, effect of sulfur, 195.
 - growth, interrelation of calcium and phosphorus concentrations on, 195.
 - hardy double and hardy thornless, breeding, S.Dak. 757.

Rose(s)—Continued.

- hybrids, chromosomal determinations, Tex. 757.
- in cold storage rooms, ethylene injury to, 339.
- in soil and soil-peat mixtures, root growth and flower production, 193.
- mosaic in Brazil, 687.
- plants, propagation and storage, Tex. 757.
- plants, storage, 338.
- powdery mildew, control in greenhouse, relation to wetting agents, 628.
- powdery mildew in Connecticut, U.S.D.A. 59.
- requirements for soilless culture, Ohio 765.
- research at Cornell University, 338.
- roots, depth and lateral spread, 338.
- soil and peat mixtures for, N.Y.State 618.
- sulfur dioxide for defoliation, Tex. 770.
- thornless, progress in, 338.
- thrips, control, 499.
- use of fertilizers on, 338.
- virus diseases, spread, 211.
- watering problem, 338.
- Rosin residue emulsion as sticker for lead arsenate in sprays, Del. 359.
- Rostrella* species causing coffee tree disease, 67.
- Rotation of crops—
 - and sequence experiments, Tex. 753.
 - effect on organic matter in surface soils, Ga. 34.
 - in Tennessee types of farming areas, Tenn. 260.
 - merits of fertilizer in, Okla. 752.
 - notes, R.I. 34.
 - on dry land and under irrigation, Mont. 612.
- Rotenone—
 - bearing roots, effect of alkaline dust diluents on toxicity, 77.
 - bearing roots, resin- and starch-cell tissues in, P.R. 600.
 - in low concentration as tickicide and insecticide for house pets, 655.
 - producing plants, effect of exhausting food reserves from, P.R. 600.
 - tests against apple aphids, 364.
- Rotylenchulus reniformis*—
 - as root parasite, U.S.D.A. 489.
 - notes, Ga. 60.
- Roughage(s)—
 - iodine in, Tex. 727.
 - problems, with emphasis on quality, 226.
- Roundworm—
 - larvae, development in feces, effect of phenothiazine on, 105.
 - of poultry, anthelmintic value of tobacco midrib powder against, 533.
- Roup, etiology and vaccine preparation, 535.
- Rubber-seed oil, Florida, U.S.D.A. 725.
- Rumanian civil code, new, and agrarian legislation, 256.

Ruminants—

- digestive diseases resulting from abnormal conditions of fore stomachs, 388.
- fasting metabolism of, 373.
- parasites of, treatment for removal, U.S.D.A. 813.
- rumen gases and bloat in, 388.
- Run-off—
 - and rainfall from watersheds—
 - and terraces of Fort Hays Conservation Experiment Station, 442.
 - of Missouri Valley, compilation, U.S.D.A. 442.
 - of Texas Experiment Station, U.S.D.A. 154.
 - and soil erosion, effect of slope on, rain simulator studies, U.S.D.A. 442.
 - silt, and stream flow, effect of vegetation and watershed treatments, U.S.D.A. 108.

Rural—

- community(ies)—
 - of an Alabama county, 266.
 - of New York, migration from, selective factors in, [N.Y.]Cornell 267.
 - school services in, Ark. 120.
- credit, *see* Agricultural credit.
- labor, *see* Agricultural labor.
- leadership, analysis, 688.
- life in process, treatise, 688.
- people, U.S.D.A. 687.
- people, social attitudes of, [N.Y.]Cornell 834.
- schools, *see* School.
- society, organization and changes, treatise, 411.
- zoning for Missouri, 115.
- zoning in South Dakota, possibilities, S.Dak. 411.
- Rust—*see also* Cereal rusts, grain rust(s), and specific hosts.
 - causing injury to ash trees in New Hampshire, U.S.D.A. 199.
 - fungi, taxonomy, Ind. 200.
 - of woody plants of Colorado, 489.
 - species on *Juniperus* in Oklahoma, 212.
 - tropical, descriptions, 773.
- Rutabagas, *see* Swedes.
- Rutgers University, notes, 432.
- Rye—
 - culture experiments, Mont. 612.
 - foot disease, new cause of, 773.
 - smut infection of susceptible and resistant selfed lines, histology, 347.
- Ryegrass, endophytic fungus in leaves of, 206.
- Rynchospora macrostachya*, extension of range of, 159.
- Saccharomyces cerevisiae* strains, varieties, or races, biochemical classification, 171.
- Saissetia oleae*, *see* Black scale.
- Salad dressings, soybean flour as emulsifying agent in, 389.
- Saliva of Eskimos, biochemical studies, correlated with dental caries, 555.

Salmonella—

bovis-morbificans fatal to sheep, 247.
california, new type isolated from turkeys, 535.

choleraesuis group, biochemical and serological studies, Ky. 103.
 group, acid agglutination in, 671.

itchfield n.sp., description, 821.

pullorum—see also Pullorum disease.

agglutination by micro-organism in turkeys, 821.

colonies, identification by macroscopic plate test, 677.

saint pauli n.sp., description, 821.

spp., from domestic animals and birds in South Africa, antigenic structure, 523.

spp., in normal hogs, 530.

suipestifer—

endocarditis caused by, 391.

group, biochemical and serological studies, Ky. 103.

infection in canaries, first recorded case, 677.

typhimurium—

fatal to sheep, 247.

from South African animals, serological variants, 523.

notes, 398.

Salsify wilt, cause, 350.

Salt—

accumulation by plants, biochemistry, 167.

balance in irrigated areas, 444.

spray damage from recent New England hurricane, 11.

stabilization of iodine in, 507.

water spray, wind-driven, effect on trees, 190.

Salts, movement, effect of irrigation, Idaho 298.

San Jose scale—

control, Idaho 357, N.Y.State 642.

females, rendered unproductive by lime-sulfur, 647.

Sandy beaches, microscopic fauna of, 595.

Sap, ascent, effectiveness of root pressure on, 450.

Sarcocystis in birds, bibliography of, 535.

Sarcophaginae and relatives in New York, 221.

Sardines, canned, analyses, Me. 694.

Sarson, insect pollinators of, 495.

Sartwellia flavescens, toxicity to goats, 819.

Sauerkraut—

canned, quality, relation to composition, N.Y.State 152.

paraffin sealing, as aid to preserving vitamin C and preventing brown discoloration, Wis. 693.

Sausage tree, movement of organic solutes in, 741.

Sausages, sulfur in, 127.

Sawfly (ies)—

black wheat stem, Ohio 225.

leaf-mining, new species on violet, 642.

pine-feeding, *Haemoterus* parasites of larvae, review, U.S.D.A. 87.

Scabies, eradication, U.S.D.A. 813.

Scale(s)—

control, dry lime-sulfur plus oil in, Idaho 357.

dormant spray for, Pa. 495.

insects—see also Black Scale and Red scale.

biological control, status, 792.

in Virginia apple orchards, 789.

new predaceous beetles on, introduction from Trinidad and Brazil, P.R. 640.

on bamboo, biological control, P.R. 640.

on citrus, development and control, 218.

predators, establishment of introduced species, P.R. 640.

Scellus, new, with key to males, 787.

Schistocerca paranensis, resistance of corn to, 645.

Schizophyllum commune, notes, 351.

School(s)—

elementary, teaching conservation in, 268.
 lunches using farm surpluses, U.S.D.A. 271.

population, changing, and its implications, 266.

services in rural communities, Ark. 120.

tax collection by districts, percentages in or near oil areas, Okla. 827.

Science and agricultural policy, U.S.D.A. 687.

Science, application, in crop production, U.S.D.A. 751.

Scirpi, American, phytogeography of, 593.

Scirtothrips citri, see Citrus thrips.

Sclerosis, multiple, treatment with nicotinic acid and vitamin B₃, 850.

Sclerotinia—

bifrons on poplar, 69.

fructicola apothecia, destruction, 58.

fructicola conidia, respiration, 628.

fructigena causing fruit brown rot, 201.

lana, cause of blossom wilt of fruit trees and ornamental shrubs, 201.

rot of beans in New York, U.S.D.A. 199.

sclerotiorum and *S. trifoliorum* in culture, production of apothecia, 344.

Sclerotium—

bataticola charcoal rot, notes, U.S.D.A. 342.

hydrophilum notes, 346.

oryzae-sativae, notes, 346.

rosetts on flax, U.S.D.A. 842.

rosetts, perfect stage, Tex. 770.

Scollidae species, parasitic on Japanese beetles, U.S.D.A. 503.

Scolytus multistriatus, see Elm bark beetle, smaller European.

Screwworm(s)—

and blowflies, U.S.D.A. 784.

larvae, lateral migration and depth of pupation, 650.

larvae, nutritional requirements, 650.

larvae, tests with, Tex. 813.

lateral migration and depth of pupation of larvae, 494.

toxicity of organic compounds to, 84.

Screwworm(s)—Continued.

toxicity of phenothiazine and related compounds to, 84.

Scurvy scale, control, N.Y.State 642.

Scurvy, effect of vitamin C on calcium, phosphorus, and nitrogen metabolism in, 711.

Scutellista cyanea, parasite of black scale, Calif. 791.

Scutigera immaculata, see Centipede, garden.

Sedimentation studies, U.S.D.A. 823.

Seed(s)—

agricultural, establishing standards on, 469.

analysis and law enforcement, application of tolerances to, 470.

analysis, complete and modified, comparison of time required for, 470.

analysis, purity, training of beginners in, 469.

blower, new, and distribution of weed seeds in, 470.

certification in Maryland, 319

control, fundamentals of, 469.

control in Tennessee, 469.

disinfectant, chlorine gas as, U.S.D.A. 774.

germination—

advantage of alternating temperatures over constant temperatures in, 16.

effect of vitamin B₁ and phytohormones on, N.Y.State 618.

tests on replicate samples, results, 470.

hard, policy for evaluation, 470.

hard-coated, dormant, germinative power, determination, 16.

industry, progress in, 469.

inspection in Kentucky, Ky. 329.

laboratories, and extension services, opportunity for cooperation between, 469.

laboratory record card data, 469.

large crop, weights of, N.Y.State 618.

laws, State, application to dealer and grower, 470.

marketing, 469.

price v. seed quality, 469.

sample and its limitations, 469.

selective disinfection, 481.

testing in Alabama, 469, 470.

testing, use of glass wool as substratum, Conn.[New Haven] 464.

tests for 1940, N.H. 616, N.Y.State 616, Vt. 616.

treatment, efficacy, effect of pathogen, environment, and host response, 58.

treatment of cereals, new machine for, Okla. 770.

treatment with chemicals in dust form, Tex. 757.

treatment with indolebutyric acid, effects, 470.

weed, see Weed seeds.

Seedbed preparation studies, Tex. 753.

Seed-corn maggot, pest of red cedar seedlings, 224.

Seedling injuries, induced by chemicals dissolving from germinator trays, 470

Selenium—

absorption by plants from soils under natural conditions, 22.

feeding repeated small doses of, effect on horses, 820.

in grasshoppers feeding on seleniferous vegetation, 490.

in plants and soils, S.Dak. 727.

in plants, toxic amount for red spider, 793.

in soils, in the United States, and toxic vegetation, U.S.D.A. 14.

in soils, use of indicator plants for locating, 807.

in toxic plants, U.S.D.A. 725.

poisoning, chronic, of rats, effect of dietary protein, 417.

poisoning, chronic, studies, 102.

poisoning in rats, liver glycogen values, 524.

poisoning of livestock, S.Dak. 813.

toxicity, effect of glutathione on, 524.

use by chicks, S.Dak. 802.

Semen—

bovine, buffering capacity of, 610.

bovine, characteristics, effect of storage temperatures, 610.

bovine, preservation in yolk-phosphate diluent and field results from use, 610

improved artificial vagina for collection, 463.

of stallions and jacks, preservation of motility, 463.

Senecio alkaloids, hydrogenation, hydrolysis, and structural results of isatidine, 814.

Septicemia, hemorrhagic, tests with immunizing agents, S.Dak. 813.

Septobasidium pseudopedicellatum, notes, 630.

Septoria—

cornicola leaf spot of flowering dogwood, U.S.D.A. 342.

leaf blotch of *Lobelia*, 200.

sp. on *Campanula*, 200.

spp., spot disease of citrus caused by, 636.

Sequoia, shoot apex, vascular differentiation in, 592.

Serangiella new genus, erection, 223.

Serangium—

new genera and species of ladybeetles related to, 223.

n.spp., description, 223.

Serica peregrina, parasites of, U.S.D.A. 503

Serratia marcescens, effects of light quality, 16.

Serum—see also Blood.

antigonadotropic, rate of loss of activity in vivo, 29.

carotenoids, determination, 150.

progonadotropic, mechanism of action, 30.

Setaria macrostachya, seed germination, 43.

Settlers, white, in the Tropics, 154.

Sewage—

- from given system, uniformity of character, N.J. 828.
- treatment, activated sludge process, N.J. 828.
- treatment plant, reducing size of sedimentation tanks, N.J. 828.

Sex—

- control in animal production, 748.
- development in rats, effect of oestrogens, 750.
- expression in willows, 26.
- hormones, *see* Hormone(s).
- variation in iron utilization by rats, 276.

Shaft louse, effect of phenothiazine, 74.

Sheep—*see also* Ewe(s) and Lamb(s).

- and goat breeds, crossing for fleece and meat production, U.S.D.A. 747.
- artificial insemination for breeding, advantages, limitations, and uses, U.S.D.A. 316.
- artificial insemination, results from, Idaho 316.
- botfly, *see* Botfly, sheep.
- breeding flock, winter feeding practices, Miss. 374.
- breeding season, effect of length of day, Ga. 89.
- Corriedale, dual-purpose breed, 280.
- dosed with phenothiazine, urine examination, 817.
- diseases, *see specific diseases*.
- effect of breeds on lamb and wool production, 226.
- effect of feeding and breeding on lamb and fleece production, Utah 796.
- effect of phosphorus deficiency on protein and mineral metabolism, 374.
- fasting metabolism of, 373.
- feeding, grazing, and management, U.S.D.A. 794.
- gastrointestinal parasites acquired during winter season, 247.
- gastrointestinal parasites, control, 388, [N.Y.]Cornell 813.
- Hampshire, twinning, increased by selection, Okla. 747.
- horns in, genetics of, 605.
- identification by tattooing, 658.
- index of purchasing power, N.Dak. 537.
- internal parasites, control, Ga. 105.
- large-scale production in New York, [N.Y.]Cornell 795.
- louse control, Ga. 74.
- maggot-fly problem, New Zealand survey, 84.
- Merino, cross-breeding, for fat-lamb production in South Africa, 375.
- Merino, in New South Wales, selection for wool production, 172.
- Merino, prenatal growth in, 800.
- metabolism of nicotinic acid in, 799.
- native, improving lamb- and wool-producing quality, Ga. 89.
- nematode parasites, recovery from pastures, 243.
- nutrition, role of nicotinic acid in, Tex. 796.

Sheep—Continued.

- on summer range, management and utilization of forage by, Mont. 655.
- outbreak of *Listeria* in, 391.
- parasites, external, Tex. 787, U.S.D.A. 784.
- parasites of digestive tract, treatments for control, [N.Y.]Cornell 813.
- phenothiazine therapy in, 529.
- poisoning, *see* Livestock poisoning.
- Plant(s), poisonous, and *specific plants*.
- production, Utah 828.
- Rambouillet, merits, 91.
- ranches in southwestern Utah, value of efficient management, Utah 115.
- range, improvement, application of genetic principles to, 313.
- rate of grazing and effect on progeny, Mont. 656.
- record of performance in, Mich. 230.
- roundworms and tapeworms, diagnosis and treatment, Mont. 672.
- Salmonella* infection, two mortalities from, 247.
- Scottish breeds and crosses, meat qualities in, 91.
- sperm membrane of, chemistry and cytology, 815.
- tapeworm, possible intermediate hosts, other than oribatid mites, 526.
- Texas bighorned, status, Tex. 782.
- tick control, Ga. 74.
- trucking v. trailing, from winter to summer range, Utah 91.

Shelterbelt—

- plantings, studies, Ind. 196.
- trees, development, effect of ground covers, S.Dak. 757.

Shigella gallinarum, notes, 677.

Shot hole borer, European, in British Columbia, 505.

Shrew, damage to seed and seedlings on cut-over Douglas fir lands, U.S.D.A. 641.

Shrub(s)—

- common to North and South American deserts, floristic significance, 24.
- for wildlife on farms in Southeast, U.S.D.A. 641.
- pests and diseases, 637.
- seed handling, improved methods, Okla. 757.
- seeds, viability, N.Y.State 618.

Sickness and medical care among rural bituminous coal-mining population, Ark. 121.

Silage—

- alfalfa-molasses and corn, and alfalfa hay, comparison for fattening steers, Pa. 506.
- alfalfa-molasses v. molasses-soybean, Pa. 517.
- alfalfa, preserved with molasses or phosphoric acid, type of fermentation in, Pa. 517.
- corn, carotene content, U.S.D.A. 662.
- corn v. legume-sorghum, for dairy cows, S.Dak. 806.

Silage—Continued.

- corn, value in fattening ration of calves, Ind. 226.
- corn, with ears left on, feeding value for beef cows, W.Va. 796.
- feeding value, U.S.D.A. 662.
- from hay crops, making and feeding, Mich. 90.
- from marrow stem kale cut in various lengths, quality, 656.
- grass—
- and mixed hay v. alfalfa hay for dairy cattle, Wash. 383.
 - forage harvesters to speed up making, Wis. 678.
 - harvesting equipment, N.J. 805.
 - practices and costs of production, N.J. 881.
 - preservatives for, Wis. 662.
 - silo pressures developed by, N.J. 805.
 - harvesting, Ind. 254.
 - hay-crop and corn, relative cost, Ohio 110.
 - hegari, utilization of grain in by beef cattle, Ariz. 89.
 - juices, corrosive action, protection of silo walls against, N.J. 805.
 - legume and grass, preparation, 508.
 - legume, as poultry feed, Tenn. 381.
 - made with mineral acids and crops rich in protein, microbiology, 797.
 - molasses, feeding value, [N.Y.]Cornell 805.
 - molasses-grass, loss of nutrients and fate of molasses, N.J. 805.
 - phosphoric acid—
 - chemical changes and effect on acid-base relations in animal body, [N.Y.]Cornell 805.
 - chemical changes in, 227.
 - feeding value, [N.Y.]Cornell 805.
 - sorghum, production, handling, and feeding, by use of trench silo, [Okla.] Panhandle 90.
- Silk—
- and weighted silk fibers, chemical identification, 717.
 - artificial, *see* Rayon.
 - cultivated and wild, description, 570.
- Supha* spp., larvae, comparative study, 224.
- Silting, run-off, and stream flow, effect of vegetation and watershed treatments, U.S.D.A. 108.
- Silver—
- as fungicide, 482.
 - sprays with promising fungicidal and adhesive properties, 628.
- Simulium* spp. new to science, 221.
- Sinusitis in turkeys, 258.
- Sipha flava*, predator of, rearing, liberation, and recovery, P.R. 640.
- Sires—*see also* Bull(s).
- proved in dairy herd improvement associations, Het, U.S.D.A. 97.
- Syrups, farm-made, research, U.S.D.A. 725.
- Tsial leaf foot disease, 634.

Sitodiplosis dactylidis n.sp., attacking seed heads of cockafout, 221.

Sitophilus granarius, *see* Granary weevil.

Skeleton, human, growth and composition, 552.

Skim milk—

- dried, supplements in low-cost diets, effects, 272.
- fresh and frozen plain, superheated, and sweetened condensed, for ice cream, 667.
- plain condensed, manufacture for ice cream making, 242.

Skins, *see* Hides.

Skunk, parasites of, in Illinois, 641.

Slag, quenched, new type, nature and lining value, 303.

Slime molds, studies, 23.

Slips, women's, buying guide, U.S.D.A. 429.

Smoke columns, visibility, factors affecting, 197.

Smoke tree wilt, due to *Verticillium*, U.S.D.A. 342.

Smut—*see also* Cereal smut(s), and specific hosts.

- diseases of cereals, 345.

- fungi, physiologic specialization and genetics of, 23.

- of India, taxonomic studies, 200.

Snail, brown, infestations, 493.

Snakeroot, white, poisoning in Arkansas, 814.

Snapdragons—

- in cold storage rooms, ethylene injury to, 339.
- new tetraploid, N.Y.State 617.
- requirements for soilless culture, Ohio 765.

Snow—

- injury to conifer plantations, Mich. 626.
- surveys, Utah 823.

- surveys, photographic method of making, Colo. 678.

Snowball bushes, deformed by aphids, N.Y. State 647.

Soap substitutes, new, unsatisfactory for home laundering, Mont. 717.

Social—

- and economic research, sampling method in, bibliography, U.S.D.A. 834.

- and economic survey of Beadle County, South Dakota, 120.

- insurance and agriculture, 545.

- planning, local, long-time experiment in, 688.

- science courses required by agricultural colleges, Tenn. 268.

- sciences, survey in, 688.

Society of American Foresters, historical summary, 478.

Sociological research, rural—

- cooperation in, 688.

- in the South, 688.

Sociology—

- contribution to agriculture, U.S.D.A. 687.

- rural, selection and recruitment of personnel in, 688.

Sod(s)—

native, base-exchange capacity, Colo. 588.

new, introduction for observation, Tex. 753.

Sodium—

chlorate, toxicity, in Yakima Valley soils, W.Va. 739.

chlorate, toxicity, relation to nitrates, N.Dak. 184.

deficiency, extreme, effect on mineral metabolism of rats, 699.

hypochlorite, bactericidal efficiency against *Phytomonas sepedonica*, 627.

hypochlorite, merits for seed treatment, 484.

oleate, concentration-mortality curves for solutions toxic to eggs of *Lygaeus kalmii*, 360.

Soil(s)—

acid forest, characteristic fungi of, 202.

acid, of Mississippi, lime requirements, Miss. 15.

acidity, effect of crops, R.I. 13.

acidity, effect of heavy applications of dusting sulfur, 619.

acidoids and basoids, thermal stability, 155.

aggregation, solution concentration as possible factor, 299.

Alabama, phosphorus removed from, 178.

alkali, *see* Alkali.

analyses, sampling for, field variation as factor, 178.

and liming materials, 582.

and water conservation studies, Tex. 299, 823, Va. 589.

and water losses, effect of manure and shallow tillage, Idaho 298.

bacteria, activities, Utah 735.

bacteria, nutritive requirements, relation to rhizosphere, 302.

bacteria, physicochemical behavior, relation to soil colloid, 589.

boron deficiency in, Conn.[New Haven] 442.

boron deficiency in, sunflowers as indicator plant of, 468.

chemistry and physics, research, U.S.D.A. 734.

Coastal Plain, nitrogen, organic carbon, and pH of, effect of green manure crops, 177, 301.

conditions, relation to response from green manure, 179.

coniferous timber, studies, Idaho 298.

conservation—
accomplishments for, U.S.D.A. 736.

balanced vegetative program for, 177.

effect of cover crops and manure, N.J. 759.

effect on yields, farm income, and time required for farm operations, Okla. 827.

in South Carolina Piedmont, U.S. D.A. 736.

Soil(s)—Continued.

conservation—continued.

not new problem, but of increasing acuteness, Miss. 141.

on flue-cured tobacco farms, management aspects, Va. 683.

possible, U.S.D.A. 687.

program, costs and results in western Pennsylvania, Pa. 682.

program, effect on farm operations, Okla. 402.

records from cooperative studies in vineyards at Hammondsport, U.S.D.A. 589.

studies, 256.

conserving cropping system, adoption, possibility of higher incomes from, Wis. 682.

conserving crops, percentages of increase, Ohio 736.

crop-producing capacity, Mont. 612.

deficiencies, plant tissue tests for, N.Y. State 582.

dynamic properties applied to elements of implement design, Ala. 109.

erosion—

and rate of infiltration, Ariz. 13.

and rebuilding of eroded soils, W.Va. 736.

and related land use conditions, U.S.D.A. 736.

and run-off, effect of aggregation on, 736.

and run-off, effect of slope on, rain simulator studies, U.S.D.A. 442.

bibliography, U.S.D.A. 588.

control, economic phases in, 255.

control, effectiveness of trashy fallow and contour seeding, 736.

control, in California and Nevada, U.S.D.A. 300.

control, planning for, 412.

control studies, N.J. 735.

control work on highways, U.S.D.A. 823.

in United States, cost and extent, U.S.D.A. 736.

measurement plats, effect of different amounts of rainfall, Miss. 300.

measurements and control experiments, U.S.D.A. 300.

fertility—

and improvement, Tex. 753.

effect of lime, manure, and commercial fertilizers on yields, Ind. 179.

greenhouse study, Tex. 735.

plant growth as index, Pa. 442.

relation to land use, N.J. 735.

studies, Mont. 612, U.S.D.A. 734.

formation, electrochemistry of, 588.

freezing, 12.

from granitic materials in Mojave Desert, properties, 738.

from regional cotton wilt plats, chemical and physical studies, 178.

Soil(s)—Continued

fumigation—

in bulk for white-fringed beetle,
U.S.D.A. 493.

midge control by, 503.

with chloropierin and carbon bisul-
fide for tomato diseases, 351.

with chloropierin, response of toma-
toes to, 208.

gray-brown Podzolic, movement of anions
through profile, 155.

greenhouse, peanut hulls v. other organic
materials for use in, Ala. 44.

heating cable, electric, for warming milk
and melting ice in roof gutters and
downspouts, Idaho 399.

irrigated, salt balance in, 444.

lateritic, effect of calcium and magnesium
on physical properties, 177.

leaching studies, Conn. [New Haven] 442.

magnesium deficiency in, induced by high
rates of potash fertilization, Ind. 179

microbes, commercial use, N.J. 735.

microbial activities in, 739.

microbiology, recent advances in, 156.

micropopulation, relation to root disease
control, U.S.D.A. 735.

mineral differences, Pa. 442.

moisture—

bibliography, U.S.D.A. 588.

characteristics, use in soil studies,
737.

constants, relation to organic matter
content, 737.

effect on growth and transpiration in
Helianthus, 163.

equivalent and wilting coefficient, ef-
fect of exchange sodium on, 737

in orchards, seasonal fluctuations,
[N.Y.] Cornell 761.

studies, relation to agricultural
practices, Mont. 587.

muck, *see* Muck.

nitrogen relations, N.J. 735.

of arid and semiarid regions, H-ion con-
centration of, 582.

of Buenos Aires, *Aspergillus* spp. in, 445.

of Central Basin area and Highland Rim
area of Tennessee, effect of mineral
differences, Tenn. 14.

of Colorado, phosphate solubility in, re-
lation to pH, 157.

of De Witt County, Ill. 156.

of humid regions, H-ion concentration
of, 582.

of Kentucky, key to, Ky. 13.

of Michigan, Mich. 739.

of Montana, productivity, factors inhibit-
ing, Mont. 587.

of Morrow plate, organic carbon, pH,
and aggregation of, effect of cropping
systems, 590.

of Oklahoma, loss of sulfur from, Okla
735.

of United States, North Atlantic area,
analyses, N.J. 156.

organic carbon, effect of 3-year rotation
and fertilizer treatments, 614.

Soil(s)—Continued.

organic matter in, *see* Organic matter.

oxidation-reduction phenomena, relation
to availability of minor elements,
[N.Y.] Cornell 735.

oxygen and carbon dioxide in, effect of
type, [N.Y.] Cornell 761.

pasture and vegetable field, fertility,
Conn. [New Haven] 442.

pasture, effect of lime and phosphate on,
Ga. 34.

peat, *see* Peat.

permeability to water, effect of tempera-
ture, 588.

pH and amphoteric behavior, relation to
Donnan equilibrium, 588.

phosphorus-deficient, location, in Mon-
tana, Mont. 587.

phosphorus, nitrogen, and organic mat-
ter in, effect of rotations and manure
for twenty years, 591.

pore space, effect on plant growth, Okla.
735.

productivity, maintenance, Mont. 587.

profile(s)—

cultivated, base-exchange capacity,
Colo. 588.

investigations, N.J. 735.

of Iowa, vertical distribution of total
and dilute acid-soluble phosphorus
in, 301.

preservation by Voigt's method, N.H.
587.

relation to recession and extinction
of Michigan lakes, 156.

virgin, phosphorus fixation in, 301.

properties of calcic, magnesian, and dolo-
mitic materials and their divergent
behavior in, 178.

properties, relation to tobacco produc-
tion of Union of South Africa, 789.

quality, of farms, Wis. 682.

rapid chemical tests in Georgia, 178.

reaction and plant growth, 34.

reaction, effect of *Juniperus* spp. on, 739.

reaction of 13 soil areas, Okla. 735.

relative infiltration and related physical
characteristics, U.S.D.A. 13.

science and agronomy, contributions to
rural land classification, Mo. 820.

scientists, satisfactory reading material
for, 587.

selenium in, S.Dak. 727.

series, new hydrologic, pedography of,
738.

sterilization against nematodes, ethylene
chloride for, 639.

sterilization, electric, Ind. 254.

structure, determination, 155.

survey in—

Illinois, De Witt, Jasper, and Cum-
berland Counties, Ill. 442.

Indiana, Jennings Co., U.S.D.A. 156.

Indiana, Steuben Co., U.S.D.A. 442.

Iowa, Audubon Co., U.S.D.A. 156.

Iowa, Franklin Co., Iowa 298.

Montana, middle Yellowstone Valley
area, U.S.D.A. 156

Soil(s)—Continued.

survey in—continued.

New York, Ulster Co., U.S.D.A. 156

Texas, Kaufman Co., U.S.D.A. 13.

Texas, Zavala Co., U.S.D.A. 156.

Wyoming, Uinta Co., U.S.D.A. 13.

survey, status, Tex. 735.

temperature, relation to *A. millaria* root rot, 627.

temperature, relation to other factors controlling disposal of solar radiation, 738.

testing, selecting a microchemical method, 178.

treatment suggestions for subirrigated San Luis Valley, Colo. 300.

treatment with chloropicrin, effect on following crop, R.I. 34.

tube jack, rapid-action, description, 155.

types, genetic, microbial numbers and nature of organic matter in, 739.

types, physical and chemical studies, Utah 735.

types, productivity ratings, Mo. 828.

uncultivated and cultivated Appalachian upland Podzol, organic matter of, comparison, 738.

under trees, accumulation of zinc in, 158.

water, see Soil moisture.

Solanum species in Buenos Aires area, chromosome numbers, 313.*Solenopsis cyloni*, notes, 74.

Solutions, nutrient, see Culture media.

Sore mouth of lambs, vaccination for, Colo. 668.

Sorghum—

and corn, comparison and effects on succeeding grain crops, Tex. 753.

and corn in alternate rows, S.Dak. 752.

breeding for low HCN content, S.Dak. 752.

charcoal disease, Tex. 770.

charcoal rot, Okla. 770.

chinch bug resistance in, effect of fertilizers, 79.

double cropping experiments, Tex. 753.

grain, breeding, Ariz. 33, Colo. 612, Tex. 753, U.S.D.A. 751.

grain, culture experiments, Tex. 753.

grain, fertilizer experiments, Tex. 753.

grain, irrigation tests, Tex. 753.

grain, varieties, planting tests, Ariz. 33.

grain, variety tests, Ariz. 33, Tex. 752.

hybrid vigor in, Tex. 753.

hybrids, resistance to chinch bug, Okla. 736.

in Nebraska, U.S.D.A. 342.

inheritance studies, Tex. 753.

root and stalk rots, Okla. 770.

varieties and hybrids, reaction to mild disease, U.S.D.A. 485.

varieties, forage yields, Tex. 753.

Sorgo—

antianemic potency, Miss. 427.

breeding, Tex. 753.

variety tests, Ariz. 33, Ga. 33, Tex. 752.

South Dakota College, notes, 482, 720.

South Dakota Station, notes, 482, 720.

South Dakota Station, report, 859.

South in progress, 690.

Sow(s)—see also Pig(s) and Swine.

breeding, applications of reproduction physiology to, 314.

brood, comparison of protein mixtures for, Ind. 227.

Duroc-Jersey, desirable types, Okla. 747.

milk production, effect of frequency of nursing and litter size, Idaho 372.

Soybean(s)—

and soybean products, nutritive value and mineral deficiencies for swine, Ind. 227.

and soybean products, studies, U.S.D.A. 725.

breeding, Ind. 178, [N.Y.] Cornell 751, P.R. 613, U.S.D.A. 751.

carbohydrates of, Ind. 150.

carotene from, chromatographic identification and biological evaluation, 731.

constituents research, Ind. 150.

cultural and harvesting tests, Ariz. 33.

culture experiments, Tex. 753.

edible, rise of, 183.

effect of preceding crop, 320.

feeding to pigs, effect on gains and method of producing firm carcasses, N.C. 659.

flour as emulsifying agent in salad dressings, 839.

for hay, seeding rates, Miss. 34.

for hay, seeding tests, Utah 753.

goitrogenicity of, 511.

ground, for calves, Ind. 226.

hay phosphorus, availability to white rats, 657.

improved, U.S.D.A. 751.

in rotations, response to fertilizers, Ind. 179.

injury from locust leaf miner, 369.

inoculation, Ind. 179, Tex. 753.

meal as protein concentrate in turkey starting rations, Idaho 372.

meal, oil, and proteins, industrial uses and suitable varieties, N.Dak. 440.

meal v. cottonseed meal, 373, Ark. 655, Ind. 226.

milk, possibilities of, 183.

mosaic, insect transmission, 775.

nodule bacteria, studies, 448.

oil and meal, current consumption, 182.

oil, glycerides, separation of, Ind. 150.

oil meal, effect of varying level for fattening calves, Ind. 226.

oil meal, solvent-extracted, effect of replacing with soybeans in low fat ration, Mich. 656.

oil, nonfat constituents, Ind. 150.

oil, sterols from, preparation, Ind. 150.

oil, tolerance of chicks for, 511.

oil, vitamin A-suppressing factor in, 228, Ind. 224.

or soybean products, effect on milk production, Ind. 224.

pages on, 182.

production, variety recommendations and characteristics, N.C. 41.

Soybean(s)—Continued.

- proteins, digestibility, U.S.D.A. 725.
 raw and cooked, protein of, supplementary effect of cystine and methionine on, 510.
 response to phosphate and lime and to inoculation, Ga. 34.
 role in human nutrition, 183.
 salted, improving quality of protein in, Wis. 693.
 seed germination and growth, effect of fertilizer placement, Miss. 34.
 technical papers on, 755.
 varieties, chemical composition, 726.
 varieties, cystine content, 726.
 varieties, high yielding, extend harvest period, Miss. 319.
 variety-date of planting tests, N.J. 751.
 variety tests, Ariz. 33, Ga. 33, N.J. 751, Pa. 464, 472, P.R. 613, S.Dak. 752, Tex. 752, Utah 753, W.Va. 754.
 Spectrophotometer, photoelectric, Ind. 150.
 Sperm stimulation in bulls through subcutaneous administration of ascorbic acid, 173.
 Spermatogenesis in rat, effect of thymectomy at birth, 175.
 Spermatozoa of fowl, viability, under various environmental conditions, 511.
 Spermatozoal antibodies and infertility in fowls, 608.
Sphaeropsis, new species, 23.
Sphaeropsis canker and dieback of shade trees, 68.
 Sphagnum bogs, development, in North America, 595.
Spizaria species from interesting habitats, 200.
 Spider egg sac, emergence of *Mantissa interrupta* from, 501.
 Spider mite, *see* Red spider.
 Spiders, red, *see* Red spider.
 Spinach—
 and beets, relative rates of production of asparagine and glutamine, R.I. 13.
 downy mildew, control by dusting, Tex. 771.
 irrigation, Tex. 758.
 New Zealand, vitamin C in, 135.
 variety tests, Pa. 472.
 Spindle, isolation and identification, 604.
Spirocera lutea, life history, 675.
Spirocera sanguinolenta, life history, 675.
Sporotrichum bud rot renamed central bud rot in carnations, reasons for, 352.
 Sportsmen's organizations, suggested action program for, 213.
 Spotted fever, Rocky Mountain, virus, highly virulent strains, isolated from ticks, 525.
 Spray(s)—*see also* Fungicides, Insecticide(s), and specific forms.
 contact, La. 358.
 copper, *see* Copper.
 deposition and retention on apples, Pa. 496.
 dormant, dinitro v. tar oil, 74.
 equipment, materials, and methods, Kans. 333.
 materials, new and safer, Pa. 495.

Spray(s)—Continued.

- measuring inoculum potential and coverage index, 627.
 mixtures, role of lime in, relation to arsenical and copper injury, N.J. 760.
 nonpoisonous, [N.Y.] Cornell 786.
 nonpoisonous, for leaf-eating insects on shade trees and shrubs, N.J. 786.
 oil, *see* Oil spray(s).
 orchard, low temperature tar oil in, 76.
 practices and fruit diseases, 351.
 pyrethrum, prolonging toxicity, 496.
 research, W.Va. 787.
 residue(s)—
 and removal, U.S.D.A. 784.
 as affecting the processor, 78.
 from lead arsenate, ratio of lead to arsenic in, 643.
 loads of arsenic, lead, and fluorine, Idaho 357.
 removal, use of sulfamic acid in, Ind. 185.
 tolerance, change in, aid to apple and pear growers, N.Y. State 215.
 stickers, N.Y. State 630.
 timing and selection to reduce arsenical residue on crops, N.J. 760.
 Sprayer operated by compressed air, description of and drawings, 361.
 Spraying—*see also* Dusting and specific crops.
 aerial, tests with concentrated mixtures for, 75.
 and dusting methods, concentrated mixtures v. standard, U.S.D.A. 493.
 Spruce—
 Christmas trees, retarding needle fall on, 626.
 fir type of southern Appalachians, early planting experiments in, 198.
 gall aphids, control, Mont. 786, N.Y. State 642.
 Norway, vegetative propagation, 767.
 sawfly, European—
 larval disease prevalent in heavy infestations, 654.
 notes, U.S.D.A. 784.
 parasite, establishment in United States, 654.
 white, propagation by cuttings, 767.
 Spurge, leafy, introduced into Utah, Utah 43.
 Squash(es)—
 breeding, Ga. 44, N.Y. State 618.
 bug, studies, Conn. [New Haven] 494.
 bug, synonymy, morphology, and life history, Conn. [New Haven] 646.
 foot rot, new, due to *Fusarium* sp., Conn. [New Haven] 490.
 Green Gold, new variety, 719.
 improvement by inbreeding and recombination, Conn. [New Haven] 471.
 mosaic virus, insect transmission, host range, and properties, 627, 789.
 seedless fruits from varieties, 617.
 summer, heterosis in, and possibilities of producing F₁ hybrid seed, 187.
 vine borer, studies, Conn. [New Haven] 494.

Squirrels—

damage to seed and seedlings on cut-over Douglas fir lands, U.S.D.A. 641.
equine encephalomyelitis virus in brains of, 250.

gray, population study, Tex. 355.

Stains, methyl violet and Nile blue, use, 600.

Stains, old Gruebler hematoxylin and eosin compared with current American, 18.

Stallion sperm, preservation of motility, 463.

Stamens, comparative morphology, 169.

Standards of living of New Zealand dairy farmers, 267.

Staphylococci—

avian, pathogenicity, 527.

from food poisoning, effect of organic acids, sugars, and sodium chloride, Mich. 698.
in herds free from streptococcus mastitis, and effect on milk composition, 808.
of animal origin, studies, 526.

riboflavin production of, [N.Y.] Cornell 806.

strains isolated from outbreaks of arthritis in chickens, 676.

Starch(es)—

grain, anatomy of, 16.

grains and plastids, double-staining, for permanent preparations, 600.

research, U.S.D.A. 725.

Starlings—

attack on warble-infested cattle in Great Plains area, 73, 356.

male, sexual activation, relation to daily exposure to light, 177.

Statistical—

analysis, methods, treatise, 287.

methods for medical and biological students, treatise, 287, 858.

methods, solution of normal equations giving standard errors of constants, 859.

methods, treatise, revision, 858.

procedures and their mathematical bases, 858.

reasoning, elements of, treatise, 718.

Steers—see also Cattle, beef.

and rabbits, relative ability to digest pasture herbage, 228.

choice yearling feeder, grain and silage winter ration for, Okla. 795.

fattening—

beet-top silage for, N.Dak. 508.

comparison of protein-rich supplements for, [N.Y.] Cornell 795.

in dry lot in summer v. in winter, rate and efficiency of gains, Idaho 372.

rations compared, Tex. 796.

roughages for, comparison, Pa. 506.

shelter v. no shelter for, Ala. 88.

sorghum grains v. corn for, S.Dak. 795.

value of peanut hay for wintering, Ala. 88.

feeder, relation between conformation and their feeding and slaughter efficiency, Ariz. 89.

Steers—Continued.

finishing with grass and grain, W.Va. 659.

phosphorus requirements and adequacy of home-grown feeds, Idaho 372.

yearling, pastures for finishing, W.Va. 796.

Stellaria media, chloroplasts, isolated, reduction of ferric oxalate by, 165.

Stem rust, migrating South to spend winter, U.S.D.A. 768.

Stenodiplosis geniculati dactylidis from cocksfoot, 221.

Stereum murrayi, role in heart rot and cankers of living hardwoods, 637.

Sticktight flea, distribution and hosts, 74.

Stictoccephala festina, see Alfalfa hopper, three-cornered.

Stimulation and anesthesia, protoplasmic nature of, 744.

Stinkbug(s)—

damage to flax, Tex. 787.

notes, Tex. 787, Utah 787.

Say's, notes, Colo. 642, Mont. 786, N.Dak. 499.

Stock, see Livestock.

Stock foods, see Feeding stuffs.

Stocks—

double-flowered, selection, U.S.D.A. 757.

in cold storage rooms, ethylene injury to, 389.

requirements for soilless culture, Ohio 765.

Stockyards fever, see Septicemia, hemorrhagic.

Stomach—

lesions in rats on vitamin A-deficient diet, 560.

poisons, toxicity, effect of temperature, 359.

worms—

anthelmintic efficiency of compounds related to phenothiazine, 672.

anthelmintic efficiency of Lentin against, 248.

in sheep and goats, Tex. 813.

in sheep, control, 818, Ga. 105.

larvae from eggs in cattle feces, culturing large numbers, 526.

larvae, third stage, accessibility to grazing animals, 816.

phenothiazine as anthelmintic for, 896.

resistance of sheep to, Tex. 813.

Stomacoccus plantis, control, 218.

Stomatitis, mycotic, of goats, 673.

Stomatitis, vesicular, U.S.D.A. 818.

Storage cabinet, low temperature storage, for preservation of viruses, 344.

Storms crossing Alaskan coast into Canada, peculiarities of, 535.

Storms that have caused great floods, 11.

Strategus quadricostatus, protective seed treatments, etc., against, P.R. 640.

Strawberry(ies)—

ascorbic acid in, varietal differences, 423.

Bellmar variety, leaf variegation or June yellows in, U.S.D.A. 342.

Strawberry(ies)—Continued.

- Blakemore, number of leaves in November, relation to number of flowers the following spring, 53.
 breeding, N.J. 761.
 breeding for disease resistance, Conn. [New Haven] 471.
 control of white grubs in, 85.
 crown borer, poison bait for control, 357
 culture, Kans. 763, Mont. 617.
 culture, South Atlantic and Gulf Coast regions, U.S.D.A. 763.
 effect of leaf removal and crown covering, 622.
 effect of straw mulch on, 53.
 everbearing progressive, yellowing in, 627
 farms, management and cost study, La. 830.
 fertilization, N.Y.State 618.
 flower formation, effect of nutrient elements at time of, 622.
 improvement and outstanding seedlings, 760.
 inbreeding experiments, Conn.[New Haven] 47.
 leaf roller, American, biology and control, 75, 501.
 leaf roller, American, control, 75.
 Massey, description, N.C. 622.
 methods of retarding ripening, Mich 192
 plants, survival, effect of ice, 53
 production, prices, returns, etc., N.H. 685.
 protecting from root worms and white grubs, 859.
 red core root disease, 773.
 red stele disease, 210.
 red stele disease, breeding for resistance to, U.S.D.A. 756.
 root knot nematode affecting, 60.
 root weevil, Utah 787.
 roots, effect of high soil temperature, Okla. 757.
 rootworm, Mont. 786.
 rootworm as nut pest, 870.
 seed size in, 763.
 spraying, promising results, Ark. 630.
 Tennessee Supreme, a new variety, Tenn 54.
 variety tests, Mont. 617.
 virus diseases, 635.

Stream flow—

- in Missouri River Basin, 824.
 silt, and run-off, effect of vegetation and watershed treatments, U.S.D.A. 108.

Streptococci—

- descriptions, classification, and distribution in milk, 393.
 β -hemolytic, in equine infections, 249.
 hemolytic, associated with bovine udder, 818.
 hemolytic, infections in horses, sulfanilamide treatment, 675.
 heterofermentative, fermentation end-products of, 520.
 in swimming pool water, 745.

Streptococci—Continued.

- isolated from equine encephalomyelitis, toxic substances produced by, 105
 lactic, action of disinfectants on bacteriophages for, 520.
 mastitis, detection, efficiency of examination of incubated milk samples for, 888.
 mastitis, efficiency of soaps and other disinfectants in destroying, 670.
 of bovine mastitis, studies, N.H. 395
 of unusual types, mastitis caused by, 395.
 other than *Streptococcus agalactiae* in cow's udder, 527.
 taxonomy, physiology, and morphology, [N.Y.] Cornell 806.

Streptococcus—

- acidominimus*, 816.
agalactiae, differences within species, 393
agalactiae, gas-forming and proteolytic variant of, 527.
lactis, growth and acid formation, inhibitory effect of rancid milk on, 605.
lactis in mastitis milk, growth responses, 238.
paracitrovorus, effect of glucose on anaerobic dissimilation of citrate by, 455.
thermophilus, notes, 522.

Strongyles in horses—

- control, [N.Y.] Cornell 818.
 phenothiazine as anthelmintic for, 397.

Strongyloides spp., tests of phenothiazine against, 396.

Strongylosis, equine, control, 397.

Strontium lactate, radioactive, secretion in milk following intravenous administration, 808.

Strongylosis neuvomica, culture, P.R. 618.

Students, college—

- ascorbic acid metabolism of, Utah 836.
 nutritional status and blood values, W.Va. 841.

Stumpage and log prices for 1938, U.S.D.A. 841.

Sturmia rhodesiensis n.sp., parasite of cotton bollworm, biology, 83.*Suokirya suokirya*, poisonous to livestock, Colo. 668.

Sucrose taste thresholds of rats and humans, 697.

Sudan grass—

- and buffalo grass, comparison, Tex. 758
 bacterial stripe, resistance to, Tex. 770.
 breeding, Tex. 753.

Helminthosporium blight, resistance to, Tex. 770.

hydrocyanic acid in, factors affecting, Colo. 612.

rust, resistance to, Tex. 770.

seed as carrier of many disease fungi, U.S.D.A. 768.

stands, increases in by seed treatment, U.S.D.A. 768.

strains, grazing tests, Tex 752.

Sugar beet(s)—see also Beet(s).

- black root control, strip method of soil treatment for, 58.

Sugar beet(s)—Continued.

- black root, notes, Mont. 630.
- breeding, U.S.D.A. 751.
- byproducts, feeding value, Idaho 372.
- costs and returns, Mich. 831.
- crop sequence effects on, Mich. 183.
- culture, Minn. 327.
- diseases and pests of, atlas, 206.
- diseases in Mexico, U.S.D.A. 769.
- effect of preceding crop, 820.
- fertilizer experiments, Mont. 612.
- flowering, photothermal induction of, 467.
- Fusarium* yellows, Mont. 630.
- hybrid vigor in, 41.
- irrigation tests, Tex. 753.
- leaf spot resistant variety, new, 206.
- losses, reduction by rotation and manure, U.S.D.A. 751.
- phosphate deficiency in, Mont. 630.
- production practices, Mich. 756.
- rasping machine, description, 7.
- research, U.S.D.A. 725.
- root disease, phosphate applications for, U.S.D.A. 769.
- seed industry, domestic, expansion and dependence on superior varieties, U.S.D.A. 751.
- seed production, domestic, as outgrowth of breeding for disease resistance, U.S.D.A. 751.
- seed production studies, Ariz. 83, Tex. 752.
- seedling diseases, greenhouse experiments for control, 58.
- variety for early planting with resistance to diseases, U.S.D.A. 751.
- variety tests, Mont. 612, Tex. 752, Utah 753.
- Verticillium* wilt, 64.
- webworm, Mont. 642, 736.
- yellows virus, green peach aphid as vector, 65, 365.
- yields, increase by nitrogen fertilization, U.S.D.A. 751.

Sugarcane—

- and cane sugar, U.S.D.A. 725
- aphid, yellow, predator of, rearing, liberation, and recovery, P.R. 640.
- beetle, effect of lime in reducing injury by, La. 358.
- beetle, studies, 495.
- borer—
 - Amazon fly as parasite, 368.
 - in Barbados, 219.
 - injury, varietal susceptibility of cane to, La. 358.
 - new races of parasites of, P.R. 640.
 - parasites, receipt of new strains from Brazil, P.R. 640.
 - parasitization, by *Metagonistylum minense*, and hyperparasitization of latter by *Trichopria* sp., P.R. 640.
 - studies, 495, U.S.D.A. 784.
 - Trichogramma* spp. as parasites, La. 358.
- breeding, U.S.D.A. 751.

Sugarcane—Continued.

- breeding, relation to colchicine seed treatment, 615.
 - chlorotic streak—
 - effect of hot-water treatment for, 207.
 - in Louisiana, 206, 207.
 - spread, U.S.D.A. 768.
 - cold-tolerant, U.S.D.A. 751.
 - disease, description and history of spread in Puerto Rico, 206.
 - diseases and pests, 200.
 - distribution of mineral elements in, 293.
 - farms, social study of labor and tenancy, La. 119.
 - Fiji disease, transmission, 60.
 - for sirup, variety tests, Tex. 752.
 - leafhopper, Indian, bionomics and control, 363.
 - mosaic, insect transmission, 495.
 - nitrogen nutrition, amounts-of-nitrogen test, 615.
 - nitrogen-potash-sunlight relations, 615.
 - production, integration of climatic and physiologic factors, 308.
 - quality, effects produced by different soils, 299.
 - root stimulation by ethyl alcohol and other substances, 305.
 - sirups, antianemic potency, Miss. 427.
 - stalk, inversion of sucrose in different parts, 437.
 - treatise, 183.
 - variety tests, P.R. 613.
 - windrowing and storing, following injury by freezing temperatures, U.S.D.A. 468.
- Sugar(s)—*see also* Lactose, Sucrose, etc.
- in blood, *see* Blood sugar.
 - in plant materials, determination, Shaffer-Somogyi reagent for, 729.
 - natural and refined, effect on oral lactobacilli and caries among Eskimos, 697.
- Sulfanilamide—
- effect on parasitic infections of laboratory rats and mice, 244.
 - in tobacco, toxicity, 15.
 - progress in use in animal diseases, 243.
- Sulfapyridine—
- in avian tuberculosis, 244.
 - in cattle, pharmacology, 383.
 - progress in use in animal diseases, 243.
- Sulfur—
- and sulfur compounds, relation to insect control, [N.Y.]Cornell 736.
 - calcium, copper, and zinc, studies, 532.
 - composts and acid development in soils, Tex. 735.
 - compounds, organic, bacteriostatic and bactericidal action, 524.
 - compounds, vapors from, therapeutic action, 59.
 - containing compounds, utilization for growth, 132.
 - determination in biological material, 8.
 - dioxide, effect on vegetation, 449.

Sulfur—Continued.

- elemental, effect on chick growth and bone ash, 95.
- in foods, 127.
- placement, Ariz. 13.
- spot and trench applications, diffusion of acidity outward from, Tex. 735.
- value in preventing coccidiosis mortality, 106.

Sunflower(s)—

- as indicator plant of boron deficiency in soils, 468.
- crown gall, secondary tumors and tumor strands in, development, 775.
- for silage, variety tests, Ind. 178.
- seedlings, boron absorption by, 449.
- varieties, forage yields, Tex. 753.

Sunlight and ascorbic acid in tomato, 596.**Superphosphate(s)—**

- for cotton, with and without limestone, Ga. 34.
- granulation of, U.S.D.A. 734.

Supply schedules, long-time and short-time, 255.**Surplus, thirty million customers for, U.S. D.A. 687.****Surra complement-fixation test, preparation of antigen for, method, 525.****Swamp fever, see Anemia, equine infectious.****Swedes—**

- effect of boron, Mont. 617.
- feeding experiments with laying ducks 233.
- fertilizer experiments, R.I. 84.

Sweet corn—see also Corn.

- breeding, Tex. 752.
- breeding, use of hybrid vigor in, 745.
- carotene in, 847.
- hybrid and inbred strains, quantity of pericarp in, 759.
- hybrids and inbreds, new, wilt resistance in, Ind. 200.
- hybrids and varieties, testing, Pa. 471.
- hybrids, development, Conn.[New Haven] 471, Iowa 331, S.Dak. 757.
- hybrids, new yellow, N.Y.State 619.
- inbred lines, quality, Ind. 150.
- inbreds and crosses released by Illinois Station, Ill. 45.
- irrigation, Okla. 757.
- production, chief limiting factor in, P.R. 640.
- spacing, N.Y.State 618.
- variety tests, Pa. 472.

Sweet peas, requirements for soilless culture, Ohio 765.**Sweetclover—**

- breeding, S.Dak. 752.
- culture experiments, Tex. 753.
- disease, hemorrhagic, preparation of concentrates, 814.
- disease of cattle, identification of toxic compound causing, Wis. 668.
- drainage requirements, Minn. 536.
- red clover, and alfalfa as hay crops, comparison, Ind. 178.

Sweetclover—Continued.

- seed viability in, farm demonstrations as measure, 470.
- variety tests, Tex. 752.

Sweetfern blister rust of pitch pines, 637.**Sweetose, use in making jelly, jam, and fruit butter, 547.****Sweetpotato(es)—**

- and tobacco, cross-inoculations with *Fusarium* from, 629.
- breeding in Louisiana, technic in, 34.
- culture experiments, Tex. 753.
- diseases in Indiana, 350.
- experiments, Tex. 753.
- fertilizer experiments, Conn.[New Haven] 464, N.J. 751, Tex. 753.
- Gold Skin, fertilizer applications for, 182.
- growth, effect of green manures, Ind. 179.

Improvement, 34.

- marketing, trends and preferences in, 34.
- meal as feed for fattening cattle, Ga. 89.
- new uses, 34.

plant production, Miss. 756.**pox control through pH adjustment, N.J. 769.****production, Miss. 319.****production, experiments with electricity in, 173.****soil rot in Louisiana, 350.****starch in, estimated from moisture content, 41.****storage diseases, control, 350.****uses as starch, food, meal, silage, or hay, Miss. 819.****variety tests, Ind. 178, Tex. 752.****vines as feed for livestock, Miss. 372.****vitamin A content, effect of fertilizers, 557.****water relations in, 177.****weevil—****flight of, La. 358.****fumigation with methyl bromide for control, 652.****notes, U.S.D.A. 784.****overwintering in the field, La. 358.****wild hosts of, La. 358.****yield and keeping quality, relation to fertilization, 41.****yield and shape, effect of height of bed, 178.****Swimming pool water, coliform bacteria and streptococci in, 745.****Swine—see also Pig(s) and Sow(s).****artificial insemination for breeding, advantages, limitations, and uses, U.S.D.A. 316.****autopsy examinations, R.I. 101.****calcium-phosphorus ratio for, Ind. 226.****diseases and parasites, in Brazil, 249.****diseases due to nutritive deficiencies, 388.****erysipelas—****agglutination test for diagnosis, 388.****distribution in United States, 388.****in human family, 388.****in South Australia, 674.****in turkeys, 389.****studies, Idaho 389, U.S.D.A. 813.**

- Swine—Continued.
pulmonary edema in, 249.
- Sycamore—
anthracnose, 637.
scale control, 218.
- Symphoromyia atripes*, studies, 503.
- Symptomatic anthrax, see Blackleg.
- Sympycnus* genus, in Utah, 503.
- Syngonium podophyllum albolineatum* leaf spot disease, 353.
- Systoechus vulgaris*, immature stages, external morphology, 368.
- Systemma acicola* n.comb., notes, 638.
- Tabanidae—
of Antilles, revision of family, 221.
of Delaware, Del. 368.
- Tabosa grass, control, Tex. 753.
- Tachinidae species, parasitic on Japanese beetles, U.S.D.A. 503.
- Tachytrechus*—
North American, key to males, 221.
tahoensis n.sp., description, 221.
utahensis n.sp., description, 221.
- Taeniothrips inconsequens*, see Pear thrips.
- Taeniothrips simplex*, see Gladiolus thrips.
- Tangelo(s)—
Pearl, new citrus variety, description, 337.
rootstocks for, and fruit seed content, 337.
- Tannin—
canaigre tubers as source, tests, Tex. 757.
function in-host-parasite relations, in white pine blister rust, U.S.D.A. 638.
native canaigre and sumac as sources, U.S.D.A. 756.
- Tanning materials, U.S.D.A. 725.
- Tapeworm(s)—
fringed, early embryonal stage in life of, 671.
infection of chicks, effect on growth rate, 251.
infection of sheep and goats acquired during winter season, 247.
of poultry, anthelmintic value of tobacco midrib powder against, 533.
of poultry, meal beetle larvae as intermediate hosts, 223.
of sheep, control, Ga. 105.
removal from chickens, tests with miscellaneous substances, 251.
- Taphrina bacteriosperma*, new host for, 730.
- Tar oil, low temperature in orchard spray, 76.
- Tarnished plant bug, factor in reducing vetch seed yields, Ala. 73.
- Tarsonemus approximatus narciest*, see Bulb-scale mite.
- Tartar emetic, toxicity to bees, 654.
- Tax(es)—
delinquency, rural, in Oregon, Oreg. 113.
exemption, homestead, in United States, U.S.D.A. 262.
law, proposed graduated land, in operation, Okla. 402.
of farmers in rural-urban fringe area, effect of city expenditures, Wis. 682.
- Tax(es)—Continued.
problems of farm property in Maryland, Md. 538.
uncollected property, on mortgaged real estate in Montana, Mont. 112.
- Taxation—
and valuation of forest land, U.S.D.A. 683.
forest land, in Michigan, U.S.D.A. 539.
revenues, collection and expenditure, Tex. 823.
rural, U.S.D.A. 687.
- Tamodium distichum*, development of foliage leaves, 311.
- Taxonomy and floristics of the Americas, 446.
- Tea, effect on energy metabolism of children, Tex. 386.
- Teeth, decay—
experimental, inhibition by fluorine in absence of saliva, 555.
of Eskimo children, dietary and metabolic studies, 554.
of Eskimos, effect of natural and refined sugars, 697.
of Eskimos, relation to saliva, 555.
role of diet in control, 853.
- Teleonomia scrupulosa*, synonymy and distribution, 499.
- Temperature(s)—see also Climate and Soil temperatures.
and humidity control, laboratory equipment for, 17.
and pressure variations, coupling between tropospheric and stratospheric, 585.
changes, daily, and solar constant variations, 153.
daily variation, effect on plant development, 599.
relations and control in greenhouses, 734.
upper soil, and shelter, comparison, 153.
- Tenants, assets available for purchasing farms, Wis. 682.
- Tenebrio molitor*, see Mealworm, yellow.
- Tenebrio obscurus*, see Mealworm, dark.
- Tennessee counties, basic data on, Tenn. 261.
- Tent caterpillar, eastern, birds eating, 366.
- Teosinte—
annual, adaptation test, P.R. 613.
annual, susceptibility to lesser cornstalk borer, P.R. 640.
seed germination, effect of soil fumigants, Tex. 771.
- Tephrosia*—
effect of exhausting food reserves from, P.R. 600.
insecticidal plants attacked by *Phyllosteryx* n.sp., P.R. 640.
tosiocaria, toxicity tests, P.R. 640.
- Terastia meticulosa*, notes, P.R. 639.
- Termites(s)—
biology and control, Conn.[New Haven] 494.
desert, injury to range grasses, Tex. 787.
desert, notes, Tex. 787.
notes, Mont. 786.
soil poison treatments, duration of efficacy, 359.

- Terraces and diversions, planning of, U.S.D.A. 828.
- Testosterone—
and methyl testosterone, androgenic and gynecogenic activities, effect of route of administration, 173.
methyl, inactivation in castrate male rats, 461.
propionate—
effect of small doses on testis, 175.
effect on female roller canaries under complete song isolation, 818.
effect on sex-life of female rat, 818.
growth-stimulating effect, 317.
injection, effect on growth of comb, testes, and ovaries in chicks, 462.
production of persistent changes in genital organs of rats by, 461.
role in inhibition of ovulation, 460.
small doses of, response of testis to, 461.
treated female rats, masculinization, 749.
- Tetany, treatment, with one massive dose of vitamin D, 567.
- Tetrachlorethylene emulsion as anthelmintic, 523.
- Tetracnemus peregrinus*, parasite of long-tailed mealybug, 865.
- Tetranychus*—
sp. on red clover, Idaho 357.
app., distribution and food plant records of, U.S.D.A. 785.
teturius, see Red spider.
- Tetraploids, colchicine induced, in dioecious and monoecious species of Amaranthaceae, 605.
- Tetrastichus*—
injurius, hyperparasite of black scale, Calif. 791.
app., parasites of four-spotted tree cricket, 505.
app., parasites of willow insects. 225.
- Texas Station, report, 859.
- Textile(s)—see also Fabric(s).
fabrics and yarns, resistance to moths, method of test for, 650.
fiber(s)—
and fabrics, effect of climatic exposure on, 428.
atlas, 570.
chemical identification, 717.
newer manufactured, developments in, 571, 572.
finishing treatments, technical evaluation, 139.
special finishes for, evaluation, 717.
- Theelin injections, blood calcium levels of fowl following, 233.
- Thelephora* spp., notes, 851.
- Theobroma*, Brazilian species, 159.
- Theresa claripalpis*—
from Trinidad, rearing and liberation, P.R. 640.
new physiological races, P.R. 640.
São Paulo strains, rearing in laboratory, P.R. 640.
- Thermobia domestica*, see Firebrat.
- Thiamin—see also Vitamin B₁
assay fungi, 22.
deficiency and bisulfite binding substances, 706.
effect on yeast growth, 22.
in food, effect of cooking, 706.
in frozen-pack garden peas, factors affecting, 413.
in quick-frozen food, 694.
in rumen content of cattle, 799.
in wheat products and return of germ to flour, 419.
minimum requirement for growing pigs, 377.
of processed meat products, 132.
properties, food sources, and stability, 847.
synthesis, by excised roots of corn, 304.
- Thielaviopsis basicola*, cultural and pathogenic habits, 632.
- Thiocarbamide, feeding experiments, 700.
- Thiourea, feeding experiments, 700.
- Thisle rust fungi in Great Britain, 632.
- Thrips on citrus fruits, 645, 790.
- Thrips tabaci*, see Onion thrips.
- Thurberia weevil, U.S.D.A. 784.
- Thyanta custator*, U.S.D.A. 784.
- Thylakentrin, proposed name for follicle-stimulating hormone of anterior pituitary, 609.
- Thymectomy at birth, effect on spermatogenesis in rats, 175.
- Thyroid—
activity, relation to periodic ophthalmia, 674.
gland in lambs, effect of lack of iodine in ration, Colo. 668.
relation to thymus in chicks, 510.
secretions, effect on feather development in pigeons, 462.
tissues from rats and fowls, histological studies, Colo. 668.
- Thyroidectomized rats, effect on lactation and growth, 461.
- Thyroidectomy, effect on production, quality, and composition of eggs, 515.
- Thyronectria austro-americana*, diseases of *Gleditsia* caused by, 68.
- Thyroxine—
and hypervitaminosis-A, interrelation, 181.
effect on social order in flocks of hens, 461.
- Thysanoptera—
cocoon-spinning, 499.
new American, descriptions, 217.
- Thysanotoma actinioides*—
early embryonal stage in life of, 671.
studies, 388.
- Tick(s) —
and relapsing fever in United States, 794.
eradication, U.S.D.A. 813.
studies, U.S.D.A. 784.
- Tillage machinery, principles of hitches for, Pa. 536.
- Tilletia tritici*, dwarf race, studies, 633.

Timber—*see also* Lumber and Wood.
 fallen, measurements, Conn.[New Haven] 478.
 farm-grown, marketing, N.J. 766.
 salvage, in trees killed by bark beetles, 870.
 wind-thrown, decay and other volume losses in, U.S.D.A. 780.

Timberland, private, forestry on, U.S.D.A. 478.

Time preference and conservation, 255.

Time, use of, relation to home management, [N.Y.] Cornell 286.

Timothy—
 breeding, 321, [N.Y.] Cornell 751.
 composition and nutritive value, effect of mid-June fertilization, N.J. 805.
 selection and inbreeding in, 321.

Tin as chloride or sulfate, effect on plant tissues, 741.

Tinea—
ditella from grain stores in Great Britain, 361.
insectella from grain stores in Great Britain, 361.

Tingitidae, new—
 from Eastern Hemisphere, 499.
 South American, 217.

Typha spp.—
 colonization, N.Y. State 642.
 parasitic on grubs of *Anomala* and *Sericia*, U.S.D.A. 503.

Tissues, living, effect of velocity of crystallization on freezing point, 16.

Tmolus eohion larvae, injury to pineapples, 501.

Tobacco—
 and potato rotations, Pa. 464.
 and sweetpotato, cross-inoculations with *Fusarium* from, 629.
 assimilation of ammonia nitrogen by, 164.
 breeding, U.S.D.A. 751.
 Bright, plant nutrient absorption by, time and rate, 178.
 budworm, enemy of cotton in Peru, 219.
 Burley, seasonal movements in prices and sales, Ky. 408.
 callus cultured in vitro, production of auxin by, 17.
 cost of production, P.R. 831.
 curing, equipment for experimental work in, 177.
 curly top virus, acquired immunity to, U.S.D.A. 768.
 disease(s)—
 in Kentucky, U.S.D.A. 768.
 resistant types, produced at University of Kentucky, 634.
 survey in Wisconsin, U.S.D.A. 199.
 downy mildew—
 control, 203, Conn.[New Haven] 480, Miss. 350.
 immune variety, U.S.D.A. 751.
 notes, U.S.D.A. 769.
 etch virus, quantitative measurement, 628.
 farming economics of Va 258

Tobacco—Continued.
 farms, management aspects of soil conservation, Va. 683.
 fertilizer experiments, Conn.[New Haven] 464, Pa. 464.
 flea beetle—
 host plants, relative importance, 781.
 in plant beds, tests of insecticides against, 494.
 notes, Pa. 495, U.S.D.A. 784.
 test of insecticides against, 652.
 flue-cured, fertilizer recommendations, N.C. 828.
 frogeye disease, recent research in Ceylon, 634.
 Granville wilt, crop rotations for control, 629.
 high-nicotine, production, U.S.D.A. 751.
 insects in 1937, U.S.D.A. 785.
 insects on flue-cured type, control, U.S.D.A. 493.
 insects on sun-grown cigar type, U.S.D.A. 493.
 Institute of Puerto Rico, reports, 328.
 irrigation and harvesting experiments, Conn.[New Haven] 464.
 leaf, amide synthesis in, Conn.[New Haven] 437.
 leaf spot diseases, control, Pa. 480.
 leaves, *Bacterium tabacum* invasion of, mechanism, 627.
 microflora of aging cigarette leaf, 745.
 midrib powder, anthelmintic value against poultry tapeworms and roundworms, 538.
 mosaic, size stability under different conditions, 635.
 mosaic virus—
 effect on cellular oxidation, 629.
 increase, and changes accompanying nitrogen compounds in detached tobacco leaves, 58.
 nucleoprotein, action of electrolytes on solutions of, 436.
 protein, refractory diffusion method, study, 776.
 purified, solubility studies, 207.
 relation to ascorbic acid, 635.
 varieties which localize it, 635.
 moth larvae, effect of insecticidal residues in cured tobacco, 857.
 moth, notes, U.S.D.A. 784.
 necrosis virus, comparative host ranges, 344.
 new virus disease with delayed symptoms, 65.
 nitrogen nutrition, effect on virus inactivation, 629.
 plant beds, soil treatments for, 627.
 plants deficient in potassium, starch formation in, 165.
 production and consumption in Manchuria, U.S.D.A. 411.
 ring spot recovered plants, experimental production of symptoms in, 629.
 ring spot virus, comparative host ranges, 344.
 roots, nematode disease of, U.S.D.A. 59.

Tobacco—Continued.

- seedbeds, sterilization with chloropicrin, U.S.D.A. 768.
 - seedlings, growth, use of ground peanut hulls in promoting, U.S.D.A. 751.
 - soils of Union of South Africa, 730.
 - streak and yellow dwarf of potato, comparison of viruses, 631.
 - survey in Puerto Rico, U.S.D.A. 768.
 - through three centuries, 469.
 - varieties resistant to cabeca virus, 207.
 - vein-banding necrosis, 207.
 - viruses, classification and nomenclature, 350.
 - warehouses, open, fumigation tests in, 357.
 - white Burley, cost of curing with artificial heat, Ky. 117.
 - white Burley, quality, effect of temperature and relative humidity during and after curing, Ky. 328.
 - wildfire and seedbed sterilization, 481.
- Tocopherol—*see also* Vitamin E.
- α -, additions to normal diet, effect on lactation, 713.
 - α -, another lower homolog of, 728.
 - α -, prevention and cure of muscular dystrophy by, 713.
 - d -alpha, prevention of deficiency disease in chicks by, 506.
 - and its acetate with natural vitamin E, therapeutic equivalence, 714.

Tomato(es)—

- acid content, effect of soil moisture, 832.
- and tobacco worm, Calif. 792.
- and tomato products in rations of fur animals, 93.
- ascorbic acid in, Ga. 122.
- ascorbic acid in, relation to sunlight, 596.
- bacterial disease, [N.Y.] Cornell 709.
- bacterial ring rot, 628.
- bacterial wilt, southern-grown plants as sources in Indiana, Ind. 200.
- big bud, in Pacific Northwest, 58, 351.
- breeding, N.J. 758.
- bronze disease, thrips-transmitted, 645.
- bushy stunt virus—
 - diffusion constant, 208.
 - purification by differential centrifugation, 207.
 - sedimentation rate, 208.
- canned, effect of calcium and potassium fertilizers, 473.
- canned, vitamin A in, effect of storage, 557.
- canned, vitamin C destruction in, prevention, Wis. 693.
- canning, factors affecting acidity, N.Y. State 618.
- collar rot epidemic traced to setting of infected plants, Ind. 200.
- collar rot, nitrogen nutrition of seedlings as affecting susceptibility to, Ind. 200.
- comparison of nutrient solutions for transplanting and for packing for shipment, 188.
- copper fungicide tests on, 628.

Tomato(es)—Continued.

- copper in, 731.
- culture and fertilization, Ga. 44.
- curly top, in southern California, U.S.D.A. 199.
- curly top resistance, development and testing, Utah 771.
- curly top virus, wild varieties resistant to, Idaho 342.
- defoliation—
 - aspects of, U.S.D.A. 342.
 - diseases, new sprays and schedules for, Conn.[New Haven] 480.
 - diseases, notes, U.S.D.A. 630.
 - diseases, resistance to, Ind. 200.
- diseases—
 - control, Ga. 60, R.I. 60.
 - in Indiana, Ind. 350.
 - in Mexico, U.S.D.A. 769.
 - in Utah, Utah 771.
 - in western Tennessee, U.S.D.A. 50.
 - notes, Tex. 770.
- early blight, dusting tests for, Tex. 770.
- effect of hardening treatments, W.Va. 758.
- Essary, fruit characters and yielding capacity, Tenn. 472.
- fertilization, new methods, 472.
- fertilization, studies, N.J. 758.
- firmness of, N.Y.State 618.
- Florida, marketability, effect of maturity, 473.
- fresh and canned, factors affecting quality, Ind. 185.
- fruit pox etiology, Tex. 770.
- fruit rot, caused by *Phytophthora oosporet*, 347.
- fruitworm, studies, Colo. 642, Ga. 74, Tenn. 792, Tex. 787, U.S.D.A. 784, Utah 787.
- Fusarium* wilt, Tex. 770.
- green, salting, Mich. 584.
- greenhouse, foliar diagnosis as index of nutritional needs, 46, Pa. 471.
- greenhouse, root knot nematode control, R.I. 60.
- greenhouse, yield, effect of size of fertilizer application, 473.
- growth, relation to phosphorus concentrations in nutrient supply, N.J. 758.
- high vitamin C content, breeding, S.Dak. 757.
- hybridization, 760.
- improvement, Pa. 471.
- irrigation, Okla. 757.
- leaf blight, control by spraying, N.Y. State 630.
- leaf blight in Philippines, 685.
- leaves, *Phytophthora infestans* on, 351.
- mineral deficiencies in, injection for diagnosis of, 449.
- mosaic, virus causing and its transmission by seed, Ind. 200.
- mulching, N.J. 758.
- new varieties and selections, Utah 758.
- Ohio-packed, quality and retail prices, 269.

Tomato(es)—Continued.

- on Sassafras sandy loam, availability of replaceable potassium to, 332.
- Phomopsis* fruit rot, 629.
- phyllloid flowers, morphological and anatomical features, 776.
- pinworm, Calif. 792.
- planting methods, Utah 758.
- plants—
 - culture and training, R.I. 44.
 - greenhouse, spacing, Okla. 757.
 - handling for long transit, U.S.D.A. 757.
 - northern- v. southern-grown, N.Y. State 618.
 - protection, use of aster cloth houses for, Okla. 757.
 - southern-grown, treatment, U.S.D.A. 758.
 - training, W.Va. 758.
 - treated with chemicals, induced formation of β -gentiobiosides in, 20.
 - use of nutrient solutions in transplanting water for, 188.
- production, improved methods, Ga. 187.
- production without pollination, 332.
- protection from beet leafhopper, Idaho 357.
- pruning, Tex. 758.
- psyllid, Colo. 642, Mont. 786.
- response to fertilizer ingredients, 188.
- response to soil fumigation with chloropierin, 208.
- ring spot virus—
 - comparative host ranges, 344.
 - transmission from currant to tobacco, 628.
- root knot and wilt, soil fumigation with chloropierin and carbon bisulfide, 351.
- root knot nematodes, U.S.D.A. 489.
- roots, excised, growth, and heterosis in, 593.
- roots, excised, response to β (4-methylthiazolyl-5)-alanine, 304.
- rot due to soil mold, Colo. 774.
- rotations, value of cover crops in, N.J. 758.
- seed, development and differentiation of seed coat, 592.
- seed production, Ind. 185.
- seed tests, 769.
- seedlings transplanted from sand, damping-off control in, 627.
- soil fumigation with chloropierin for, R.I. 60.
- spotted wilt, studies, 776, U.S.D.A. 59.
- spraying, R.I. 44.
- sprays for *Alternaria* control, timing and dosage, 628.
- starter nutrient solutions for, W.Va. 758.
- stem rot or canker, 209.
- streak disease in New Zealand, 209.
- time of pollen tube extension through style and rate of fruit growth, 381.
- toe rot, new fungi causing, 630.
- unstaked, pruning, 188.

Tomato(es)—Continued.

- value of rye and vetch green manure crops for, W.Va. 758.
- variety tests, 331, Ga. 44, Pa. 472.
- Victor, description, Mich. 188.
- vitamin C in, Utah 836.
- wilt *Fusarium*, single-spore isolates from, pathogenic and cultural variation, 777.
- wilt resistance of Riverside variety, 65.
- wilt-resistant varieties, breeding, U.S. D.A. 757.
- yields, effects of copper sprays, 629.
- Toria, insect pollinators of, 495.
- Tornadoes in United States during 1884, synoptic conditions accompanying, 153.
- Tortoise, Florida gopher, arthropods found in burrows of, 73.
- Torulopsis* n.spp. on grapes and in grape products in California, 171.
- Torymus pulchellus*, parasite of willow insects, 225.
- Tosoplasma*, avian, organisms described as, 527.
- Tocoptera graminum*, see Green bug.
- Tracheae, penetration by different fluids and results, 788.
- Tractor(s)—
 - costs in Michigan, Mich. 679.
 - rubber tires for, Ind. 254.
- Trade—
 - agreements, reciprocal, new method of tariff making, U.S.D.A. 687.
 - domestic and foreign, fields of International Confederation of Agriculture in, 110.
 - foreign, meaning for agriculture, U.S. D.A. 687.
 - internal, in farm products, barriers to, U.S.D.A. 687.
 - international, reduction of obstacles to, viewpoint of agriculture, 110.
- Tradescantia* generative cells, effect of colchicine on division, 310.
- Trametes* spp., notes, 351.
- Transpiration—
 - effect on mineral uptake in plants, 449.
 - in horticultural plants, environment-control chamber for study, 164.
 - in wheat, effect of leaf rust, 774.
 - of a leaf from earliest stage to its fall, 17.
 - rates in plants, significance of ethereal oils in, 450.
- Transportation problem of agriculture, U.S.D.A. 687.
- Transschella pruni-spinosae discolor*, uredio- and teliospores, germination experiments, 772.
- Tree(s)—
 - bleeding canker disease, additional hosts and locations for, U.S.D.A. 768.
 - coniferous, see Conifers.
 - diseases—
 - latest findings of trade importance, 779.
 - leaflets on, 687.

Tree(s)—Continued.

diseases—continued.

systemic, control, 68.

virus, of forest and shade species, 68.

distribution, studies by diameter classes in virgin timber stands, Pa. 478.

evergreen, *see* Evergreens.

for Washington farms, Wash. 341.

forest, photosynthetic activity, Vt. 197.

freezing injury, U.S.D.A. 768.

growth as index of rainfall and temperature, 296.

hardwood—

bleeding canker, tree injection for control, 628.

in forest nurseries, soil fertility standards for, 766.

living heart rot and cankers associated with *Stereum murrayi*, 637.

of Arkansas, volume tables for, Ark. 57.

resources and industries, Ark. 57.

Ustulina vulgaris decay in, 69.

husbandry, outstanding needs for research in, 779, 789.

important East African, comparative ages, relation to their habitats, 150.

inoculation for disease and insect pest control, 637.

migration, trends, in Kansas, 341.

pests and diseases, 637.

pests of orchard and city, Okla. 786.

physiology, 24.

ring(s)—

analysis, technic, 454.

as record of precipitation in western Nebraska, 296.

of California redwoods, problems in dating, 296.

series in Douglas fir, photographs showing features important in correct interpretations, 296.

seed handling, improved methods, Okla. 757.

seedlings, damping-off of, 779.

seeds, forest, germination, [N.Y.] Cornell 766.

seeds, viability, N.Y.State 618.

shade and street, safeguarding against disease, N.J. 769.

shade, insect injury to, 75.

shade, protecting from insect damage, Ill. 216.

shade, *Sphaeropsis* canker and dieback on, 68.shelterbelt, *see* Shelterbelt(s).

species, development by experimental forest nursery, Ind. 196.

toad, coast, mating and oviposition in, 357.

trunk pressures, internal, attempt to record, 25.

uprooting, disturbance of forest soil resulting from, 339.

varieties, Mont. 617.

weed, killing, value of chemicals for, Pa. 478.

Tree(s)—Continued.

wound dressings, 758.

Treefern fiber for orchid baskets, P.R. 018.

Trematodes, new species, from herons, 641.

Trialeurodes vaporariorum, *see* Whitefly, greenhouse.*Triatoma*—*heldmanni*, natural infection with *Trypanosoma cruzi* in Texas, 393.*sanguinea*, *see* Conenose, bloodsucking.*Tribolium castaneum*, *see* Flour beetle, red.*Tribolium confusum*, *see* Flour beetle, confused.

Tributylin agar, use in dairy bacteriology, 240.

Trichina infection in swine, detection, 348.

Trichinella spiralis—

larvae, in heart, liver, stomach, and kidney of experimentally infected swine, 530.

larvae, in vitro effect of immune serum on, 245.

transmission of immunity to, from infected animals to their offspring, 244.

Trichinosis—

situation, U.S.D.A. 813.

spread, relation to municipal garbage disposal, 393.

studies, Mass. 124.

Trichocereus spachianus, structure of shoot apex, 592.*Trichodectes*—*crassus*, parasite of raccoon, 783.

ovis, notes, Ga. 74.

Trichoderma—

spp. from pinewood soil, 202.

spp., relation to mushroom diseases, control, Pa. 480.

viride, effect on corn seedlings, and role as plant pathogen, 346.*Trichogramma*—*minutum*, egg parasite of oriental fruit moth, U.S.D.A. 502.

spp., parasites of sugarcane borer, La. 358.

Trichogrammatidae from Palearctic region, new genera and species, descriptions, 788.

Trichomonas—*donasae* in ruffed grouse, 399.*fetus* in heart blood of an aborted fetus, 818.*gallinae*, pathogenicity for baby chicks, 107.*gallinae*, transmission from chicken to other birds, 322.*gallinarum*, redescription, 535.

Trichomoniasis, unusual case, and suggestion for chemotherapy, 396.

Trichopoda pennipes, parasite of squash bug, Conn. [New Haven] 646.*Trichopria* sp., notes, P.R. 640.*Trichopsylla lotoris*, parasite of raccoon, 788.

Trichostrongylosis—

in calves, yeast as adjunct to anthelmintic treatment, 817.

treatment, tests of various drugs, 248.

treatment with copper sulfate and nicotine sulfate, 672.

- Trichostrongylus*—
axei, test of phenothiazine against, 531.
 larvae, third stage, accessibility to grazing animals, 816.
retortaeformis, parasite of rabbit, 72.
 species, studies, 73.
 tests of phenothiazine against, 396.
vitrinus in sheep and anthelmintics against, 818.
- Trichuris ovis*—
 anthelmintic efficiency of Lentin against, 248.
 tests of phenothiazine against, 396.
- Tridentaria implicans* n.sp., description and parasitic relations, 212.
- Tridymus salicis*, parasite of willow insects, 225.
- Trifolium* species, adaptation to different ecological environment, 177.
- Trimethylamine as a plant sex hormone, 17.
- Tripsacum*, *Euchlaena*, and corn, genetic and cytological relations, Tex. 753.
- Trogoderma khapra*, reactions to light, 788.
- Trout—
 migration of, Pa. 495.
 nutritional requirements, [N.Y.]Cornell 781.
 tagged, taken by anglers, Pa. 495.
- Truck crop—
 and garden insects, U.S.D.A. 784.
 diseases due to soil mold, Colo. 774.
 diseases in Tidewater Virginia, control, Va.Truck 483.
 insects, Tex. 787.
- Trucks, see Motor trucks.
- Trypanosoma*—
cruxi, natural infection of *Triatoma heidemanni* with, 393.
 from wild birds of Mexico, 214.
- Tubercle bacilli—
 growth on malate media, effect of zinc on, 671.
 human and bovine types, differentiation, 671.
- Tuberculin and other diagnostic tests, U.S.D.A. 813.
- Tuberculosis—
 avian, frequency and source of infection for man and animals, 676.
 bovine, 818.
 bovine, eradication in United States, 671.
 dark adaptation in persons with history of, Ariz. 121.
 effect of diet on resistance to, 855.
 eradication, U.S.D.A. 813.
 in sheep, bovine type, 672.
 in starling, 399.
 vitamin C in, 712.
- Tuberculouslike lesions of swine, role of *Corynebacterium equi* in, 530.
- Tulip—
 anthracnose, notes, 59.
 diseases, [N.Y.]Cornell 769.
 root and bulb rots caused by *Pythium*, 200.
 1 virus, separation from illy-latent by cytological methods, 58.
- Tulip tree, seed formation, viability and collection, 478.
- Tumidiscopus orochelimumis*, parasite of *Orochelimum*, 506.
- Tumor-producing agents, viruses of, 669.
- Tung oil, research, U.S.D.A. 725.
- Tung oil, solvent extraction from press cake, U.S.D.A. 725.
- Tung tree, hardness in, relation to dormancy, U.S.D.A. 756.
- Turf—
 disease, new fungus, 629.
 fine, experiments with, N.J. 751.
 injury by chloropicrin, R.I. 60.
- Turkey(s)—
 blood protozoan infection in, 535.
 bone deformities in, Utah 796.
 broad breasted Bronze, concentrate feeding, 516, 661.
 broad-breasted Bronze, description, and value of breed, 516.
 composition, effect of age and sex, 510, 516.
 cross-breeding for better market quality, W.Va. 748.
 effect of artificial illumination, Pa. 463.
 eggs, hatchability, improvement, Okla. 748.
 eggs, need of turning during latter stages of incubation, 510.
 fecundity, effect of lights, 510.
 feeding and confinement rearing experiment, Mich. 661.
 feeding grasshoppers to, 516.
 feeds, Utah 657.
 flocks, small, stoneyard for and management practices, Mich. 234.
 hatchability, effect of soybean meal, S.Dak. 802.
 intestinal mucosa, post-mortem autodigestion of, 253.
 management, Kans. 382.
 marketing, Tex. 828.
 meat production in, Utah 796.
 minimum yard space for, Okla. 802.
 need of vitamin A supplements for, S.Dak. 802.
 paratyphoid studies in, 389.
 poult, cottonseed v. soybean meals, Okla. 802.
 poult, effect of lights, Okla. 802.
 poult, protein levels in rations for, Ind. 233.
 pox virus, egg propagation of, 532, 822.
 production in Missouri, Mo.Poultry 97.
 purebred and crossbred, body weights and measurements, 510.
 riboflavin requirements for breeding, Colo. 655.
 small-type, development, U.S.D.A. 747, 794.
 sorghums and millets for, S.Dak. 802.
 starting and growing rations for, Ind. 227.
 starting rations, value of soybean meal as protein concentrate in, Idaho 872.
 strains differing widely in body weights, Ind. 173.

- Turkey(s)—Continued.
 value of electric lights for, Ind. 227.
 whole oats for, value, Pa. 507.
- Turnip(s)—
 aphid, notes, Tex. 787, U.S.D.A. 784.
 beetle, red, Mont. 786.
 effect of boron, Mont. 617.
 greens, ascorbic acid in, Ga. 122.
 greens, changes in vitamin C content during boiling under different conditions, 423.
 mosaic, host range in New Zealand, 200.
 seedlings, light requirements, Pa. 471.
 Turpentine still buildings and equipment, U.S.D.A. 733.
- Tur-pod fly parasite, life history and morphology, 225.
- Twigs, dry preservation, in natural form and color, 602.
- Twinning, in farm animals, 456.
- Tylocladia fragariae*, see Strawberry crown borer.
- Typhlocyba pomaria*, see Apple leafhopper, white.
- Typhoid bacillus, preparing antigenic substances from, 102.
- Udder, cow's, suspensory apparatus and circulatory system, U.S.D.A. 662.
- Ultramicroscope, recent results with, 430.
- Ultraviolet—
 irradiation and vitamin C metabolism, 283.
 light sources, efficacy in killing bacteria suspended in air, 22.
- Umbrous, coat character in mice, case of dominance modification, 28.
- Uncinula jaborosa* n.sp., on leaves of *Jaborosa integrifolia*, 344.
- Undulant fever treated with sulfanilamide, 671.
- U. S. Department of Agriculture—
 Library, notes, 143.
 report of Secretary, 859.
 yearbook, U.S.D.A. 686.
- Urea—
 hydrolysis in soils, nature of catalyst causing, 157.
 nitrogen, utilization by chicks, Nebr. 94.
 utilization by lactating cows, Wis. 662.
- Uredinales of Colombia, 344.
- Uredinales, flexuous hyphae, 627.
- Uredineae, Argentinian, little known, 632.
- Uredo ingae* on *Inga uruguensis*, 632.
- Urinary calculi, Colo. 668.
- Urine—
 ascorbic acid in, determination, 439.
 nicotinic acid determination in, 9, 274.
 of mare, oestrin content, relation to oestrous cycle, 610.
- Uromyces phaseoli typica*, notes, U.S.D.A. 199.
- Uromyces sorghi*, studies, 201.
- Ustilago
bulgarica, host specialization in, 482.
hordei, effect of X-rays on chlamydospore germination, 773.
setae—see also Corn smut.
 physiologic forms, in Argentina, 632.
- Ustilago vulgaris*, on sugar maple, 69.
- Utah College, notes, 432.
- Utah Station, notes, 432.
- Utah Station, report, 859.
- Uterus—
 masculinus of rabbit and reactions to androgens and oestrogens, 174.
 of cats, response to injection with oestradiol benzoate, 460.
 of rabbit, changes in with advent of pregnancy, 30.
 pseudopregnant, of mouse, hypertrophy in following mechanical stimulation or treatment with vitamin E, 31.
 weight of rats and mice, effect on progesterone and amniotin combinations, 750.
- Vaccines, studies, Idaho 389.
- Vagina, artificial, improved, for collection of stallion and jack semen, 463.
- Vaginal smear in rat, inadequacy as index of ovarian dysfunction caused by diet, 175.
- Vallneria spiralis* leaves, growth in nutrient solution, effect of β -indolyl acetic acid, 440.
- Valonia, potassium isotopes in, separation, 166.
- Vanilla—
 curing, processing, and extract preparation, P.R. 582.
 cuttings, immersing in dilute nutrient solutions, effect on germination, P.R. 618.
 damage by *Hepantheria toasia*, P.R. 630.
 disease of unknown cause, P.R. 630.
 latex, toxicity, P.R. 582.
- Varicose ulcers, vitamin B₁ for relief of pain in, 703.
- Variety testing, use of trial grounds for, 470.
- Vegetable(s)—
 affected by boron deficiency in eastern Virginia, Va.Truck 759.
 and fruit market, Knoxville wholesale, buyers and buying problems, Tenn. 264.
 and fruit market, Knoxville wholesale, taxes and regulations, Tenn. 406.
 and Potato Council, Northeast, 110.
 and vegetable products, research U.S.D.A. 725.
 auctions, small-lot country, operation, U.S.D.A. 832.
 breeding experiments, Tex. 787.
 Chinese, dried, sugared, and salted, vitamin C in, 282.
 conserving quality and food value, Mont. 693.
 cooking in salted water, mineral losses in, Ind. 269.
 cultivation requirements, [N.Y.] Cornell 759.
 culture experiments, Tex. 757.
 defoliation diseases, new sprays and schedules for, Conn.[New Haven] 480.
- disease(s)—
 and pests, 200.
 control, use of fixed copper compounds in, 847.

Vegetable(s)—Continued.

disease(s)—continued.

on Chicago market in 1939, U.S.D.A. 342.

on New York market, U.S.D.A. 199, 769.

resistant varieties, for home garden, U.S.D.A. 759.

effect of hardening treatments, W.Va. 758.

fertilizer placement for, Pa. 471.

fertilizer requirements, Okla. 757, R.I. 44.

fertilizers for, Conn.[New Haven] 442.

Florida, vitamin C in, effect of maturation and cold storage, 564.

for Great Plains area, testing, U.S.D.A. 757.

freezing preservation, Utah 836.

freezing, vitamin A losses from, N.Y. State 693.

fresh and frozen, determination of carotene in, 847.

frozen, loss of vitamin C in storage, 566.

frozen-pack, importance of, 270.

frozen-pack, preservation of quality, 270.

fumigated with methyl bromide, total bromides on, 644.

grading and fast freezing, Ind. 185.

green leafy, rotation plantings for year-round supply, Miss. 330.

grown in representative regions of State, mineral composition, Tex. 826.

grown on muck soil, yield and composition, effect of common salt, 330.

insect(s)—

insecticides for control, N.Y.State 642.

pests in Guam, 358.

pests in Hong Kong, 78.

relative efficiency of rotenone-containing insecticides for, Ala. 73.

intensive production on sandy land, soil management for, Conn. [New Haven] 442.

iodine in, Tex. 727.

irrigation, Ark. 617, Pa. 471.

leafy, antianemic potency, Miss. 427.

leafy, fertility and soil needs, Miss. 330.

Long Island, fertilizer needs, [N.Y.] Cornell 759.

marketing, cost of operating farm motor-trucks in, [N.Y.] Cornell 827.

Ohio packed, quality and retail prices, 269.

on Yuma mesa, cultural needs, Ariz. 44.

optimum levels of nitrate nitrogen for, R.I. 18.

phosphorus fertilization, 759.

preparation for freezer storage and how to use them, 415.

production on toxic orchard soils, 185.

production without pollination, 332.

riboflavin content, 422.

root knot, advances in chemical control, N.J. 769.

seeds, tests, N.Y.State 618.

Vegetable(s)—Continued.

seeds, threshing, Idaho 399.

spraying to reduce arsenical residue on, N.J. 760.

sulfur in, 127.

testing, Okla. 757.

transplanting and fertilizer treatments to obtain earlier maturity in, Mont. 617.

value of turning under crimson clover for, Ga. 44.

varieties, testing, S.Dak. 757.

varieties, testing for canning, N.Y.State 618.

variety tests, Pa. 471, R.I. 44, Tex. 757, W.Va. 758.

vitamin B₁ and vitamin G in, effect of quick-freezing and canning, 561.

vitamin C in, 852.

weevil, studies, Ala. 73.

Vegetation—see also Flora and Plant(s).

aquatic, of Allegheny and Chemung watersheds, 446.

effect of sulfur dioxide, 449.

herbaceous, of Edwards Plateau, 24.

of Texas, 446.

relation to climatic conditions, Ariz. 33.

type maps of California and western Nevada, 594.

types, distribution, application of hyther-graph to, 296.

Velvetbean caterpillar—

on peanut, Ga. 75.

outbreak in Alabama, and control, 82.

Velvetbeans, feeding value, 656.

Venturia inaequalis, see Apple scab.

Veratrum viride extracts, insecticidal action, 339.

Vermicularia trichella on *Hedera helix*, U.S.D.A. 769.

Vermont Station, report, 287.

Vermont University, notes, 143.

Verticillium—

alb-atrum, wilt of cotton, in Texas, U.S.D.A. 342.

as plant pathogen, importance of, 488.

disease of chrysanthemums and other greenhouse plants, [N.Y.] Cornell 769.

hosts, in California, U.S.D.A. 342.

sp., isolated from roots of salsify, 350.

wilt of sugar beet, 64.

wilt of tomato, resistance of Riverside variety to, 65.

Vetch(es)—

breeding and selection for disease resistance, Ga. 60.

bruchid, notes, U.S.D.A. 784.

disease of unknown cause, 480.

diseases, seed-borne, problems of, N.Y. State 202.

hairy, as green manure for cotton, Tex. 753.

reaction to pea aphid, varietal differences in resistance, 646.

seed germination and growth, effect of fertilizer placement, Miss. 34.

Veterinary—see also Animal diseases.

- bacteriology, textbook, 813.
- education, need and significance of veterinary preventive medicine, 888.
- medicine in America, history, 100.
- students, infection from horse cadavers used for dissection, 391.
- Vibrio fetus*, cause of abortion in sheep, 528.
- Vibrio septique* infection, treatment with sulfapyridine, 102.
- Viburnum aphid, control, N.Y.State 642.
- Viola villosa*, impermeable seed, viability, 470.
- Vinegar generator for farm or small manufacturer, Mich. 679.
- Vine-mesquite, seed germination, 43.
- Vinyl resin fibers, chemical identification, 717.
- Vinyon, new textile fiber and yarn, 572.
- Violets—
 - cytological, breeding, and physiological studies, Vt. 185.
 - of Alachua County, Florida, ecologic notes, 159.
- Virginia College, notes, 861.
- Virginia Station, analytical index and list of publications, Va. 141.
- Virginia Station, notes, 861.
- Virus(es)—
 - activity, measuring, accuracy of local lesion method, 629.
 - and inclusion bodies, relations, 669.
 - animal, tabulated list, 669.
 - animal, variation in, 669.
 - natural and experimental transmission, 669.
 - nomenclature and classification, proposed system, 629.
 - of tumor-producing agents, 669.
 - plant and animal, U.S.D.A. 725.
 - preservation, low temperature storage cabinet for, 844.
 - propagation in host, 669.
 - recent electronmicroscope findings on, 430.
 - serum control, U.S.D.A. 813.
 - sizes and methods for determination, 669.
 - species as antigens and acquired immunity to virus infections, 669.
 - studies, handbook, 631.

Vitamin A—

- activity of carotene in different vegetable fats, Ind. 227.
- additional, for improved feeding, U.S.D.A. 794.
- and nightblindness, 419.
- and thyroxine, interrelation, 181.
- biological standardisation, 280.
- deficiency—
 - and dark adaptation, new technic, 556.
 - blood analysis correlated with visual test, 702.
 - effect on malposition of chick embryo, 512.
 - in cattle, pathology of kidney in, 383.

Vitamin A—Continued.

- deficiency—continued.
 - in children, cutaneous manifestations, 559.
 - in diabetes, 854.
 - in dogs and rabbits, hematology of, 508.
 - in man, experimental, value of adaptometry, 279.
 - in rats, keratoconus experimentally produced by, 131.
 - prevalence and importance, 129.
 - revealed by blood analysis, Okla. 795.
- deficient diet, stomach lesions in rats kept on, 560.
- deficient diets, visual adaptation in adults on, photometric measurements, 130.
- egg oil as source, Okla. 795.
- for calves, green hay as source, Pa. 517.
- in blood of children, relation to biophotometer tests, 559.
- in canned tomatoes, effect of storage, 557.
- in cheese, 281.
- in chicks, effect of anterior pituitary extract, 510.
- in colostrum from cows, 519.
- in distillers' residues, 507.
- in eggs and tissues, effect of rations of hen, 510.
- in hay and silage, 657.
- in light white casein, 280.
- in liver of Chinese children and adults, 701.
- in liver of man and animals, 279.
- in liver of man, histological demonstration, 558.
- in liver, ultraviolet absorption and Carr-Price reaction, 279.
- in market milk, 848.
- in peas, frozen-pack, factors affecting, 418.
- in peas, raw frozen, cooked, and pressure-canned, 123.
- in quick-frozen food, 694.
- in rat liver, state of, after feeding various forms of the vitamin, 701.
- in rats, histological demonstration, 558.
- in serum, determination, 160.
- in sweetpotatoes, effect of fertilizers, 557.
- intake, dark adaptation as index, 123.
- metabolism, determined by rhodometer, R.I. 122.
- methods of assay and occurrence in food, 556.
- mobilization from its stores in tissues by ethyl alcohol, 702.
- nutritional requirements for, U.S.D.A. 886.
- palmitate, crystalline, preparation, 438.
- properties, food sources, and stability, 847.
- requirement(s)—
 - and values, and estimation of carotene, Ind. 268.

Vitamin A—Continued.

- requirement(s)—continued.
 - effect of age, 127.
 - of calves, U.S.D.A. 602.
 - of chicks, 510, Pa. 507.
 - of dairy cows, Ind. 284.
 - of dairy cows for production of butterfat of high vitamin A value, 285.
 - of man, 279.
 - of pigs, 376.
 - of poultry, Idaho 372.
 - reserves, depletion, in range cattle, time required for, 658.
 - response of induced prothrombin deficiency to, 715.
 - stability in irradiated milk, Wis. 664.
 - status of families in different economic levels, 419.
 - studies, Ariz. 121.
 - supplements, need of for turkeys, S.Dak. 802.
 - suppressing factor in soybean oil, Ind. 234.
 - suppressing factor in soybean oil, adsorption from, 228.
 - value of Ladino clover, Idaho 372.
- Vitamin, anti-gray hair, isolating in pure crystalline form, Wis. 698.
- Vitamin, antihemorrhagic, *see* Vitamin K.
- Vitamin, antineuritic, *see* Vitamin B₁.
- Vitamin, antirachitic, *see* Vitamin D.
- Vitamin B₁—*see also* Thiamin.
- action on growth of mycorrhiza, 743.
 - and chick nutrition, 510.
 - and riboflavin in economy of food utilization, Ark. 703.
 - and riboflavin in milk, 519.
 - and riboflavin in milk, effect of pasteurization and sterilization, 519.
 - and white flour, 560.
 - consumption, relation to exercise, 849.
 - deficiency—
 - in adults, metabolism of pyruvic acid in, 133.
 - in diabetic patients, peripheral neuropathy due to, 850.
 - in man determined by blood co-carboxylase, 704.
 - therapy of Cook County Hospital for, 850.
 - deficient diet and Wernicke's disease, identity of lesions from, 850.
 - effect on development of flowering plants, 451.
 - effect on seed germination, N.Y.State 618.
 - effect on transplanted fruit plants, N.Y. State 618.
 - excretion of subjects on different Indian diets, 181.
 - for relief of pain in varicose ulcers, 703.
 - in bean varieties grown in two localities of Michigan, 281.
 - in blood, estimation, 9.
 - in Chinese plant beriberi remedies, 703.
 - in distillers' residues, 507.

Vitamin B—Continued.

- in vegetables, effect of quick-freezing and canning, 561.
 - preparations, assay, 439.
 - pyrimidine component, photochemistry and absorption spectroscopy of, 16.
 - pyrimidine component, ultraviolet inactivation of, 16.
 - relation to plant growth, 22.
 - requirements of rats, effect of exercise, Pa. 507.
 - review of literature, 849.
 - saturation studies, 704.
 - supplement, effect on growth of infants, 849.
 - treatment of *Aleurites fordii* with, P.R. 618.
- Vitamin B₂ complex—
- deficiency and graying fur in rats, 419.
 - deficiency, effect on pigeon dermatitis, 284.
 - filtrate factor, properties, 561.
 - liver filtrate factor of, 281.
- Vitamin B₆—
- analogues, antidermatitic effect, 562.
 - and pantothenic acid, relation to factor W studies, 421.
 - crystalline, natural and synthetic, identity, 562.
 - deficiency, studies, Ala. 131.
 - effect on liver and body fat, 709.
 - effect on yeast growth, 22.
 - hydrochloride, synthetic, negative effect, in nutritional deficiency in man, 562.
 - in meat, destruction, Wis. 693.
 - method for assaying materials for, Wis. 693.
 - properties and food sources, 847.
 - toxicity, 563.
 - urinary excretion, in rat, 562.
- Vitamin B complex—
- and fat metabolism, 709.
 - and its constituents in functional digestive disturbances, 702.
 - deficient diet, effect on intestinal yeast flora of animals, 228.
 - factors, requirement for dogs, Wis. 693.
 - factors, requirements for lactation and growth of nursing rats, 420.
 - filtrate growth factor B_w in, 282.
 - new factor 8B in, evidence, 848.
 - rumen synthesis of, 807.
 - studies, 506, Ala. 131.
 - supplement, nature of, relation to ability of homocystine to replace methionine in diet, 183.
 - synthetic, reproduction in rats on, 848.
- Vitamin B₇, proposed name for antiperiosis vitamin, 513.
- Vitamin C—*see also* Ascorbic acid.
- concentration in blood during and after pregnancy, 186.
 - deficiency in cattle lacking vitamin A, Wis. 699.
 - deficiency on exclusive diet, 712.
 - destruction, during bovine digestion, Pa. 507.

Vitamin C—Continued.

- destruction in canned tomatoes, prevention, Wis. 693.
- effect on calcium, phosphorus, and nitrogen metabolism in scurvy and osteomalacia, 711.
- feeding intermittently, effect on guinea pigs, 136.
- in citrus fruits, effect of nutrient deficiencies, U.S.D.A. 756.
- in dried, sugared, and salted Chinese vegetables and fruits, 282.
- in fruits and vegetables, 852.
- in health and disease, newer knowledge, 282.
- in tomatoes, Utah 836.
- in tuberculosis, 712.
- in vegetables, 135.
- in watermelon varieties, 283.
- intra-dermal dye test for, evaluation, 710.
- loss from frozen vegetables in storage, 566.
- metabolism and ultraviolet irradiation, 283.
- nutrition and capillary fragility, 852.
- nutritional status of Montana college women, Mont. 693.
- potency of citrus fruits, effect of maturation and cold storage, 564.
- stability, to heat, Pa. 517.
- synthesis, by rats, Pa. 507.

Vitamin D—

- carriers, assays, Conn. [New Haven] 228.
- effect on lead in blood and bone, 699.
- effect on phosphorus metabolism of rachitic rats, 187.
- for poultry, S-4 Type sun lamps v. cod-liver oil as source, Ohio 804.
- in blood of dairy cattle, compared with potency of milk produced, 385.
- in distillers' residues, 507.
- in milk, assay, N.J. 805.
- milk, inspection, Conn. [New Haven] 271.
- one massive dose as shock therapy for rickets and tetany, 567.
- potency of milk, effect of sunlight and feed on, Ariz. 122.
- potency of milk of different breeds, S.Dak. 806.
- properties, food sources, and stability, 847.
- requirements of chicks, Tex. 796.
- requirements of dairy cows, S.Dak. 806.
- requirements of ducklings, 510.
- requirements of pigs, 376.
- response of induced prothrombin deficiency to, 715.
- studies, 582.

Vitamin E—*see also* Tocopherol.

- and neuromuscular diseases, 714.
- aspects of function irrespective of relation to reproductive system, 852.
- deficient rats, dystrophic, phosphorus metabolism in musculature, 228.
- deficient rats, muscular dystrophy and creatinuria in, 284.
- determination, 584.

Vitamin E—Continued.

- properties, food sources, and stability, 847.
- relation to nutritional muscular dystrophy, U.S.D.A. 662.
- requirements of male and female rats, differences in, Idaho 372.

Vitamin G, *see* Riboflavin.

Vitamin H—

- attempts to isolate, 285.
- curative of egg-white injury and presence in different foods, 284.
- curative of egg-white injury, orally v. parenterally administered, 567.
- physicochemical properties, 286.

Vitamin K—

- compounds, synthetic, effect on prothrombin concentration in man, 852.
- concentrate, anteparium and neonatal ingestion by mothers, effect on plasma prothrombin in newborn infants, 569.
- effect on chicks with avitaminosis K due to diet or to obstructive jaundice, 853.
- properties and food sources, 847.
- response of induced prothrombin deficiency to, 715.
- synthetic, and prothrombin levels in obstructive jaundice of rats, 568.
- synthetic, treatment of hypoprothrombinemia with, 569.

Vitamin K₂—

- natural and synthetic, antihemorrhagic activity comparison with proposed standard 2-methyl-1,4-naphthoquinone, 714.
- oral and parenteral toxicity, 567.
- oxidation-reduction potential, 430.
- synthesis, 294, 430.

Vitamin M, isolation and relation to susceptibility to bacillary dysentery, 853.

Vitamin P occurrence in milk, 853.

Vitamin(s)—

deficiency—*see also* Avitaminosis and specific vitamins.

- and abnormal bone growth of chicks, 518.
- anti-gray hair, in dogs and silver foxes, 506.
- deficiency, pathology of nervous system in, 704.

for war, 847.

in foods, 846.

in meat, effect of quick freezing, S.Dak. 847.

in milk that prevents stomach ulcers in guinea pigs, Wis. 693.

nomenclature, 846.

sources and physiological values, 556.

studies, 510.

unrecognized, relation to perosis, 506.

Voles, field, susceptibility to equine encephalomyelitis, 249.

Vultures, turkey, in central Iowa, 492.

Walnut(s)—

- bacteriosis control, bordeaux mixture v. insoluble copper sprays for, 58.

Walnut(s)—Continued.

blight, control with copper sprays, 487.
buds, damage by strawberry rootworm, 370.

English, composition of shell, 727.

Manchurian, testing, S.Dak. 757.

Persian, leafhoppers infesting, 363.

production, soil moisture, root distribution, and aeration as factors, Oreg. 55
trees, fumigation, 647.

War, World, and present war, effects, U.S. D.A. 256.

Warbler, black-throated green, eating tent caterpillars, 866.

Washington Station, notes, 862.

Wasp, dagger, enemy of white grubs in Java, 654.

Wasps, parasitic on larvae and pupae of ants, oviposition habits, 793

Water—

and sewage problems, results of investigations in, use of, N.J. 824.

and soil conservation studies, Tex. 299, 823, Va. 589.

and soil losses, effect of manure and shallow tillage, Idaho 298.

application efficiencies in irrigation and relation to methods, Utah 823.

bound, in normal and puddled soils, Ariz. 13.

conservation, effect of cover crops and manure, N.J. 759.

conservation, planning for, 412.

control, design of structures for, application of hydromechanics to, Utah 823.

culture, *see* Plant(s), culture.

drinking, iodine in, Tex. 727.

drinking, warming, U.S.D.A. 823.

duty of, *see* Irrigation water.

facilities, small, development in arid and semiarid sections of country, U.S.D.A. 823.

flow, sediment-laden, designs for suspended-load samplers, U.S.D.A. 824.

ground, studies in Arizona, Ariz. 108.

heaters, electric, for dairy farms, Ind. 255.

hyacinth, entomogenous fungus on spider mites on, 212.

infiltration into soil, rate and its measurement, U.S.D.A. 824.

lifting devices, home-made, Mont. 678.

pollution by industries of State, N.J. 824.

power utilization, Mont. 678.

repellency of cotton hosiery, 573.

state of, in doughs, 546.

supply—

farm, ponds for, Iowa 678.

household, copper or brass piping for, N.J. 823.

of Eloy district, Arizona, Ariz. 399.

of Hawaii, 254.

of United States, Missouri River Basin, 824.

of United States, Ohio River Basin, 678.

Water—Continued.

supply—continued.

studies based on snow surveys, Mont. 678.

volume made available daily by root growth, 744.

Waterfowl damage of crops, protecting by reflectors and revolving beacons, 213.

Watermelon(s)—

fruit thinning, 189.

Fusarium wilt, varietal resistance, Tex. 770.

seedless fruits from varieties, 617.

seeds, proteins and other nitrogenous constituents, 273.

variety tests, Pa. 472.

vitamin C in ten varieties, 283.

wilt resistance, breeding for, Ga. 60.

wilt resistance in Klondike R-7, Idaho 342.

wilt resistant varieties, testing, Okla. 757.

Watersheds, small, analysis of hydrologic data for, U.S.D.A. 442.

Waxes, chemical products from, U.S.D.A. 725.

Weasel(s)—

in central Iowa, winter and spring habits, 783.

male, reproductive cycle, 608.

Weather—*see also* Meteorological observations and Meteorology.

analysis and forecasting, textbook, 441.

and climate of Connecticut, 12.

and crops, 12.

and plant diseases, 585.

Bureau, report, U.S.D.A. 734.

data, U.S.D.A. 12.

forecasting terminology, 585.

information, presentation to public, improving, 585.

records and insect control, W.Va. 787.

reports from off Pacific coast, proposal for, 585.

station, automatic, 152.

Webworm(s)—

beet, control, Tex. 787.

on velvet bentgrass, control, B.I. 75.

sod, biology and control, in California, 647.

sod, notes, Pa. 495.

Weeds—

control, Utah 613, 753.

control experimentation, results from, 334.

control, implements for, Ind. 254.

control, in lawns and turf, merits of chemicals for, N.J. 751.

control symposium, 329.

important Michigan, Mich. 616.

killers, chemical, U.S.D.A. 725.

lawn, control, B.I. 34.

new, introduced into Utah, Utah 43.

of vacant lots in outskirts of Mexico City, 617.

of Valley of Mexico, pollen grains, morphology, 601.

Weeds—Continued.

- pasture, control, 89, Tex. 753.
- potential pest of major importance to Hawaii, 617.
- seed determinations, 469.
- seeds, factors in killing, R.I. 60.
- seeds in commercial vegetable seeds, 469.

Wells, pumping, for drainage of lands water-logged from underlying artesian basins, Utah 828.

Wernicke's hemorrhagic polioencephalitis in man, lesions of, and those produced in pigeons by vitamin B₁-deficient diet, identity, 850.

West Virginia Station, report, W.Va. 859.

Wheat—

- after-harvest sprouting in, breeding significance, 43.
- after soybeans v. after corn, Ind. 178.
- allergens, studies, U.S.D.A. 725.
- bran, feeding value, 656.
- breeding, Ga. 33, Ind. 178, Mont. 612, [N.Y.] Cornell 751, Okla. 752, Tex. 752, U.S.D.A. 751, Utah 753.
- breeding for smut resistance, Ariz. 33.
- browning root rot, control, 347.
- bunt, *see* Wheat smut, stinking.
- combining v. binding, Pa. 464.
- comparison of red clover, alfalfa, and sweetclover in rotations with, Ind. 179.
- corn and barley, comparison in diet of chickens, 802.
- crop insurance, all-risk, under Federal Crop Insurance Act of 1938, 256.
- culture experiments, Mont. 612, Tex. 753.
- dwarf smut in Montana, U.S.D.A. 59.
- experiments on dry land, Utah 753.
- feeding value for poultry, S.Dak. 802.
- fertilizer experiments, Idaho 319, W.Va. 754.
- fields, preharvest sampling, experiment in, Iowa 184.
- flag smut, U.S.D.A. 199.
- flour, *see* Flour.
- foot disease, new cause of, 773.
- foot rot growth, effect of thiamin, its components, and heteroauxin, 743.
- foot rots in Kansas and Colorado, U.S. D.A. 59.
- for sheep, cattle, and swine, feeding value, 229.
- freshly harvested, effect of ethylene, 43.
- futures, U.S.D.A. 408.
- futures of Liverpool, price relations, 543.
- futures, trading, relation to price movements, 255.
- germ oil, effect of feeding to poultry, 512.
- germ oil, effect on semen production of cockerels, 512.
- germ treatment of muscular dystrophy and nervous diseases, 714.
- germination and growth, effect of nutrient salts in organic mercurial seed disinfectants, 62.

Wheat—Continued.

- grade, milling, and baking qualities, effect of severe weathering, Mont. 612.
- hard red winter v. hard red spring, Kans. 184.
- harvesting machinery, effect on insect control, 74.
- heads, rate of transpiration from, effect of awns, 756.
- high v. low calcium and phosphorus-carrying, nutritive value, Utah 753.
- Idaho spring, behavior, Idaho 319.
- improved, U.S.D.A. 751.
- in rotations, response to fertilizers, Ind. 179.
- insect survey of 1940, Ohio 215.
- insects, notes, 789.
- leaf rust, U.S.D.A. 59.
- leaf rust races collected in Oklahoma, 627.
- leaf rust resistant Sanford variety, adapted to Georgia, 347.
- leaf rust resistant varieties for control, Okla. 770.
- leaf rust resistant variety, new, Ind. 200.
- Lemhi behavior, Idaho 319.
- light-weight, seed value, Mont. 612.
- loose smut, varietal resistance to, 629.
- marketing, cooperative, Okla. 827.
- Marquillo spring, transference of characteristics to winter wheat by crossing, Kans. 502.
- Marquis, soil temperature and growth, 469.
- mineral content, Utah 753.
- North Dakota durum, quality studies, 42.
- of different grades, cars shipped into and from Enid, Okla. 827.
- pentaploid hybrid, chromosome number and behavior in, 745.
- permanent wilting in, initial water-supplying power of soils at onset of, 16.
- phosphorus nutrition, 17.
- phytin in, effect of variety and treatment, 725.
- plant, effect of various plant foods, Ind. 179.
- plants inoculated with *Holminthosporium sativum*, use of water by, 62.
- powdery mildew, effect on yield, Ind. 200.
- prices, Chicago, relation to trading and daily price changes, 255.
- production, control of soil erosion in, 737.
- products, vitamin considerations in, 419.
- protein percentage, factors affecting, Utah 616.
- Punjab, biochemical and technological study, 42.
- respiration rate, relation to freezable water, 599.
- rhizosphere of, microbial population in, 447.
- root rot losses, relation to weeds, 62.

Wheat—Continued.

rust—*see also* Cereal rusts, Rust, Wheat leaf rust, and Wheat stem rust.

migration, airplane spore traps for study, 483.

resistance, breeding for, Tex. 770.

resistance in Il-44 and Hope wheats, inheritance of, 813.

seeds, fungus spore load carried by, hemocytometer method for detection, 470, 481.

shorts, coecidium-growth-promoting potency of, 524.

smut, stinking, growth, effect of thiamin, its components, and heteroauxin, 743.

smut, stinking, physiologic races, Idaho 342.

spikelet, formation in ear, 599

spring, breeding, Idaho 319, S.Dak. 752.

spring varieties, heat resistance of, N.Dak. 161.

spring, varieties in South Dakota, S.Dak. 42.

spring, variety tests, Idaho 319, Utah 753.

spring, yield, relation to soil moisture at seeding time, U.S.D.A. 751.

stem rust—

and leaf rust, seedling reactions of varieties to, 345.

and old and new varieties, N.Dak. 204.

fungus, population trends in parasitic strains, U.S.D.A. 768.

immunity, transference by hybridization, 62.

in 1939, control, U.S.D.A. 768.

resistance in Hope variety, effect of light and other factors, 63.

storage, profitableness to Oklahoma farmer, Okla. 681.

stored, pests, Okla. 786.

straw, hemicelluloses of, 7.

subsidization and exports, 542.

take-all growth, effect of thiamin, its components, and heteroauxin, 743.

Thatcher, development and widespread use, U.S.D.A. 751.

transpiration, effect of leaf rust, 774.

v. corn for hogs, Ga. 89.

varieties for North Carolina, N.C. 616.

varieties, grasshopper injury among, 497.

varieties, time of maturity and variety yields, N.Dak. 469.

variety tests, Mont. 612, Okla. 752, Tex. 752, W.Va. 754.

winter—

alone v. diversified cropping, U.S.D.A. 751.

breeding, Idaho 819, S.Dak. 752.

effect of soil treatments on nitrates, soil moisture, and yield, 183.

soft red, winter hardiness and quality in, Ind. 179.

variety tests, Idaho 319, Utah 753.

yield and quality, factors affecting, Ind. 179.

Wheat—Continued.

winter—continued.

yield, composition, and quality, effect of leaf rust and artificial defoliation, Ind. 200.

yield, effect of seed treatment on seed shriveled by stem rust, Ind. 200.

world, planning and economic planning in general, treatise, 680.

world situation, 1939-40, 685.

world, survey and outlook, 117, 542, 685.

yield (s)—

and milling and baking quality, effect of fertilizers, Okla. 752.

and protein content, effect of legumes and manure, Idaho 319.

effect of awns, Tex. 753.

effect of lime, manure, and commercial fertilizers, Ind. 179.

in Delta area, Miss. 319.

increase from phosphate applications, Pa. 442.

potential, soil moisture content as criterion, U.S.D.A. 751.

Wheatgrass—

beardless, at three stages of maturity, digestibility and nutritive value, 797.

bluebunch, composition, effect of stage of maturity, Idaho 372.

crested—

at three stages of maturity, composition and digestibility of nutrients, 797.

culture experiments, Mont. 612, S.Dak. 752.

dwarf, notes, Idaho 319.

for beef production, seasonal changes in value, Mont. 656.

for regressing abandoned cropland and other uses, Mont. 612.

hay and seed yields, effect of ammonium sulfate on, Idaho 319.

strains, characters, Mont. 612.

Whey—

as source of vitamins and vitamin products, 847.

dried, browning, [N.Y.]Cornell 806.

pH determination in, by color indicator paper, 294.

powder, feeding value for pigs, 93.

rennin in, inactivation, effect of heat and pH, 100.

solids in candy, 811.

utilization, U.S.D.A. 805.

White ants, *see* Termites(s).

White grub(s)—

biology, control, and taxonomy, Tex. 787.

dagger wasp enemies of, in Java. 654.

in strawberries, arsenicals for control, 85.

in Zanzibar, search for parasites of, 369.

notes, [N.Y.]Cornell 788, Okla. 786.

protection of strawberries from, 359.

species in Saratoga Forest Tree Nursery, 651.

studies, Ind. 212.

- White pine blister rust—
control, U.S.D.A. 768.
control in Michigan, 488.
function of tannin in host-parasite relations, U.S.D.A. 688.
mycelial extent beyond cankers on *Pinus monticola*, 488.
spread in 1940, U.S.D.A. 768.
studies, 480, Conn.[New Haven] 480.
susceptibility of southern gooseberry to, U.S.D.A. 769.
susceptibility of whitebark pine to, U.S.D.A. 768.
- White pine—
early development and survival, 624.
lumber, cost of production in New England, U.S.D.A. 56.
lumber from old-growth v. second-growth, 626.
propagation by cuttings, 478.
rate of diameter growth, factors affecting, Vt. 197.
spacing and rate-of-growth trials, Ga. 56.
vegetative propagation, 767.
- Whitefly—
greenhouse, control, efficiency of *Encarsia formosa* as parasite, Mich. 87.
rhododendron, 216.
- White-fringed beetle
biology, 494.
studies, U.S.D.A. 493, 784.
- Wildlife—
and farming practices in eastern Texas, Tex. 782.
conservation and mosquito control, relation, 368.
environment in marshes, blasting to improve, 490.
in land planning, 213.
in United States, status, 70.
refuge, Lake Mattamuskeet, 213.
refuges, Federal, administration of, 213.
relations, ecological, Tex. 782.
review, 213.
shrubs for, on farms in Southeast, U.S.D.A. 641.
technology, 213.
- Willia anomala*, production of citric acid by, 169.
- Willow(s)—
insects, parasites of, 225.
leaf beetle, imported, life history and control, U.S.D.A. 651.
sex expression in, 26.
watermark disease, host-parasite relations, 488.
- Wind—
dissemination of angular leaf spot of cotton, 627.
scale, geostrophic, design for, 586.
velocity, effect of forest cover on, 12.
- Windbreaks, *see* Shelterbelt.
- Wine(s)—
superior, from Concord and Niagara grapes, production, N.Y.State 693.
table, commercial production, Calif. 295.
volatile acids in, 582.
- Wire—
and fencing, atmospheric exposure, Tex. 823.
and wire products, atmospheric corrosion, Ind. 254.
high strength, for concrete reinforcement, data, Colo. 677.
- Wireworm(s)—
and potato injury, [N.Y.] Cornell 746.
biology and control, Pa. 85.
control, clean summer fallow as aid, 358.
control, effect of substitute crops and rotations, 85.
Gulf, in Florida Everglades, 223.
in Florida Everglades, 223.
populations, reducing, alfalfa as aid in, Idaho 357.
sand, control, La. 357.
studies, Conn.[New Haven] 404, N.J. 786, U.S.D.A. 784.
wheat, on potatoes, biology and control, [N.Y.] Cornell 369.
- Wisconsin Station, notes, 862.
- Wisconsin Station, report, 718.
- Wisconsin University, notes, 862.
- Women—
capacity to perform maximum anaerobic work, effect of gelatin, 843.
college, vitamin C nutritional status, Mont. 603, R.I. 122.
pregnant and nursing, vitamin A requirement, 279.
- Wood—*see also* Lumber and Timber.
British Columbia softwoods, sap stain, mold, and decay in, during transit overseas, 781.
floor finishes, care and maintenance in the home, R.I. 857.
fuel, decayed, chemical composition and calorific value, 629.
preservatives, for prevention of *Lactius* attack, experiments in Great Britain, 504.
products, preservative treatment, Conn. [New Haven] 478.
rots, fungus, methods of distinguishing, 627.
sections, prevention of curling, 454.
sound and decayed, nitrogen in, relation to loss in weight during decay, 780.
weatherproofing and fireproofing, W.Va. 827.
- Woodchuck(s)—
as soil expert, 492.
susceptibility to equine encephalomyelitis, 249.
- Woodcocks, American, banding, Pa. 495.
- Woodland and pasture combination, studies, Tex. 753.
- Woodlots, farm, management, Ind. 196, Kans. 341.
- Woody—
ornamental plants for Ohio, selected list, Ohio 55.
plants, ornamental, attractive to birds, 213.

Wool—

- fibers, classification and description, 570.
- large-scale production in New York, [N.Y.]Cornell 795.
- Merino, cystine in, relation to physical attributes, 800.
- Merino, sample, fiber fineness, determination, 855.
- production, inheritance, dam-daughter comparisons indicating, Okla. 747.
- reworked, addition, decrease of fabric strength from, S.Dak. 855.
- samples, small, accuracy for shrinkage tests, Tex. 856.
- shrinkage research, Mont. 717.
- substitutes, U.S.D.A. 855.

Woolly aphid, *see* Apple aphid, woolly.

Worms, parasitic, mechanism of acquired immunity in infections with, 523.

Wound(s)—

- and wound hormones, effects, 17.
- treatment and dipterous larvae, 85.

Wyoming Station, notes, 576.

Xenopsylla cheopis, *see* Rat flea, oriental.

X-rays—

- and plant nucleuses, interaction, N.Y. State 618.
- lethal and dissociative effects on bacteria, 311.

Xylosandrus germanus transmits Dutch elm disease, 357.

Yam beetle, bionomics, 504.

Yeast(s)—

- and mold on dairy utensils, agar slice method for detection, 521.
- ash from spectroscopic analysis, mineral composition, 15.
- bakers', carbohydrate and lipid assimilation in, 17.
- brewers', dried, alcohol-precipitate factor from, effect on chicks and hens, 514.
- cell suspensions, oxygen consumption rate, relation to oxidation-reduction potential, 17.
- compressed, viability and baking properties, effect of storage temperatures, 414.
- dietary essentials for pigeons, and their relation to vitamin B₆, 282.

Yeast(s)—Continued.

- growth rate, photomicrographic study, 170.
- growth, relation to inositol, thiamin, biotin, pantothenic acid, and vitamin B₆, 22.
- growth stimulation by minute quantities of copper, Wis. 582.
- on grapes and in grape products in California, 171.
- relation to problems of food preservation and food quality, N.Y.State 692.
- riboflavin in, 151.
- strains, biochemical classification, 171.
- vitamins, role, in growth and lactation, [N.Y.]Cornell 805.

Yellow-fever mosquito—

- development of *Plasmodium gallinaceum* and production of gametocytes in, 534.
- eggs, viability, 85.

Youngberry (ies)—

- blackberry dwarf affecting, U.S.D.A. 342.
- canes, overwintered, canker and die-back disease, 58.

Youth in agricultural villages, 834.

Zagrammosoma n.sp., parasite of new leaf miner of *Tephrosia*, P.R. 640.

Zakuklivanie disease of grain, and vector, 203, 646.

Zeldia odontocephala n.sp., on potatoes, 70.

Zephyranthes species, chromosomal determinations, Tex. 757.

Zinc—

- accumulation in soil under long-persistent vegetation, 158.
- feeding to pregnant mares, effect, 249.
- phosphide as rodenticide in orchards, 641.
- sulfur, calcium, and copper, studies, 582.
- toxicity in peat soils, [N.Y.]Cornell 735.

Zinnia—

- seeds, tests, N.Y.State 624.
- the State flower of Indiana, history and development, Ind. 196.

Zoology—

- medical and veterinary, index-catalogue, U.S.D.A. 523.
- names of genera and subgenera in, with bibliographical origin, 639.
- Zooplankton, relation to metabolism of lakes, 595.

